WESTERN FOREST

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IN THIS ISSUE: *C. Langdon White* • *Robert T. Orr*

Exhibits Department Special: Mounting Big Game Animals

Emanuel Fritz

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A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

THE CALIFORNIA ACADEMY OF SCIENCES

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Founded in 1853

VOLUME III • NUMBER 6 **Pacific Discovery** NOVEMBER-DECEMBER 1950

A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

In This Issue

Pre-Discovery

Our last rite of the year, compiling the index, gives us the chance to take a quick look back, and note where *PD* has been the last six issues. All over the map? Well, between our farthest wanderings, to Africa, and our nearest-to-home coverage, what's going on in the new addition to our own African Hall (real and simulated Africas in our first and last 1950 issues, respectively)—we see the emphasis has been on the northern semicircle of the Pacific. We have not been quite false to our namesake—this year we were in the Philippines, the Pribilofs, Baja California, Ecuador (including the Galápagos), and Chile, south to Tierra del Fuego. Nor did we neglect our own West, ranging from Mt. Rainier down along the Sierra Nevada to the Southwestern desert and plateau country. But we note an important lacuna in *PD's* map of exploration: the Pacific itself, by which we mean its mid-ocean island groups, far-off flecks on sailing charts—once, now so near in air distance, in recent memory, in mixed emotions.

Island-hopping in the World War II sense is over—for good, we hope. But we are still out there; trusteeship has brought responsibilities. There is a rehabilitation job to be done, with stress on economic improvement, health, and ultimate self-government. Teams of scientists under government auspices have been studying every phase of island life, human and otherwise, amassing data of purely scientific value and of immediate and potential practical use in meeting our obligations to warswept island people. With this island world and the scientists' own stories of their life and work there we plan to fill many '51 pages.

Discovering PD's Authors

When the author of "The Peruvian Sierra" (May-June 1949) **Dr. C. Langdon White,** was asked to do another South American piece for *PD* he gave us a choice between Bolivia and Chile. Our vote for "Chile: Nation With the Long Reach" was indicated by a curator's plans for an expedition (see pages 2 and 3, this issue). Dr. White, Stanford University professor who divides his time between Geography and Special Programs in Humanities, came through so generously on the country where the Academy's Dr. Ross will spend most of his insect-collecting months, that we shall have a full-length concluding part in the first 1951 issue. The two sections comprise a basic geographical and economic description of the stringbean nation Dr. White knows well, firsthand. The map will not be repeated; we suggest you keep it handy for Part II, and also for Dr. Ross's Chilean log, coming in soon.

PD got a clean scoop on a real "Rarity of the Deep"—well, first magazine rights, anyway—when an associate editor, **Dr. Robert T. Orr** (Academy curator of birds and mammals, University of San Francisco biology professor), his assistant, a regular *PD* contributor, and the editor, made a whaling foursome on Drakes Bay beach last summer. The story and some of Woody Williams' photos were released to the papers soon after the event, but Dr. Orr has included in his brief account here some historical background and scientific details. His full technical description will appear subsequently in one of the learned journals.

Cecil Tose, who modestly insisted on co-authorship for the description of how his department of exhibits goes about "Bringing Them Back 'to Life,'" is the Academy's chief preparator. The successfulness of the Akeley method of habitat group preparation is amply attested by remarks and exclamations overheard from the public. One of our favorites on the African Hall checkroom blotter originated with two small boys, whose nonchalance coming out of the little boys' room petrified to sudden consternation as they found themselves face to face with our chest-beating gorilla. "Come on," cried the one who first saw a way out of danger, "We'll run—run fast right past him!"

A practical forester who has seen government service, **Dr. Emanuel Fritz** of the University of California's forestry department feels, nevertheless, that there are some extreme idealists in conservation circles who fail to give privat lumber interests their due. Advisor to certain West Coast concerns, Dr. Fritz was invited to state the lumbermen's case as he sees it. His "Timber and Men" is a revision of another of the papers presented before the "Symposium on the Conservation of Natural Resources" held at Stanford University a year ago. D.G.K.

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Two Departures

PLEASE FURNISH YOUR OWN TEXT for this editorial: a mental image of an hourglass. The upper chamber of the particular example of this time-honored chronometer which we shall presume you have called up forthwith represents, if you will, a vast reservoir of facts about the natural world. The narrow aperture in the middle let us say is the California Academy of Sciences, our favorite example of an institution of scientific research and education. You, Reader, kindly conjure yourself into the lower chamber, along with every other reader of *PD*, the Academy's *Proceedings*, and all other publications; with every visitor to the Academy's exhibit halls; with every viewer of "Science in Action," the Academy television show. You are, in fact, one of an important and considerable company: the people for whom this Academy of Sciences exists.

Under the bows of the Grace Liner Santa Juana *at her berth on San Francisco's Embarcadero, Dr. R. C. Miller (left), Academy Director, and Mr. J. W. Mailliard, Jr., President of our Board of Trustees, wish the Curator of Entomology, Dr. Edward S. Ross, "good collecting" in South American countries.*

This is a composite company. It comprises a number—many hundreds—of specialists in various branches of botany, entomology, paleontology, ichthyology, and all other sciences dealt with under our auspices. It includes a corps of university and college professors, instructors, research scientists and assistants, grade school teachers, librarians. There is a large student body within it, from elementary school children to graduate students in our greatest universities. It has, in large proportion, members of that influential aggregation, the General Public, just plain people, mostly, but a section of the total company conceding nothing in relative importance. There are devoted science hobbyists in this group, and there are two million a year—San Franciscans and the City's countless visitors—who just drop in to see what our Academy buildings hold: all contribute in some degree to the popular interest without which the Academy could not discharge its educational function.

Potentially if not actually, this lower chamber contains everyone living and yet to be born—that is, if we grant that all mankind may now or ultimately benefit or be directly or indirectly affected by what transpires here.

Pursuing the hourglass figure—what is the sand? That, in our text, is the material of science, whatever *is*, to be discovered and brought out into the light of knowledge—to be run grain by grain through the Academy mill of research, for classifying, interpretation, and dissemination in usable form to the "consumer" company in our lower chamber, the users and beneficiaries of scientific information.

What we are getting to with this business about the hourglass, illustrating the dual function of the Academy—"the advancement of science through research, discovery, and public education"—is a brief mention of two departures, both taken in furtherance of the Academy's twofold mission.

One is a ship departure. The S.S. *Santa Juana* sailed October 10 from San Francisco, Valparaiso-bound, with explosives in her hold for the South American mining industry, a troupe of circus tigers, a deckload of heavy timber with our entomology department collecting truck lashed on top, our curator of insects, Dr. Edward S. Ross, and his wife in one cabin, Dr. A. E. Michelbacher of the University of California, and his wife, in another. A California Academy of Sciences entomological expedition had departed for the field. (*Note:* the Academy has received word that the *Santa Juana* arrived safely in Valparaiso.)

With their truck completely fitted out for living and working far from populated places, these four scientists will study and collect insects, plants, and other forms of life in Chile, Peru, Argentina, and other countries time may permit them to visit. The particular object of their six to nine months' field work will be to add to knowledge of the world

distribution of certain groups of insects and their plant associations. The Rosses, in line with Academy objectives, will work from the pure science standpoint; their U. C. associates will concern themselves more with economic applications of the facts discovered. With the skill of specialists they will go fishing in the "vast reservoir of facts about the natural world." Upon their return to their respective institutions they and other specialists will run the material and data collected through the mill of research – analytical study, classification, interpretation, relation to what is already known – and, through subsequent publication, make the facts and principles discovered available to all interested parties.

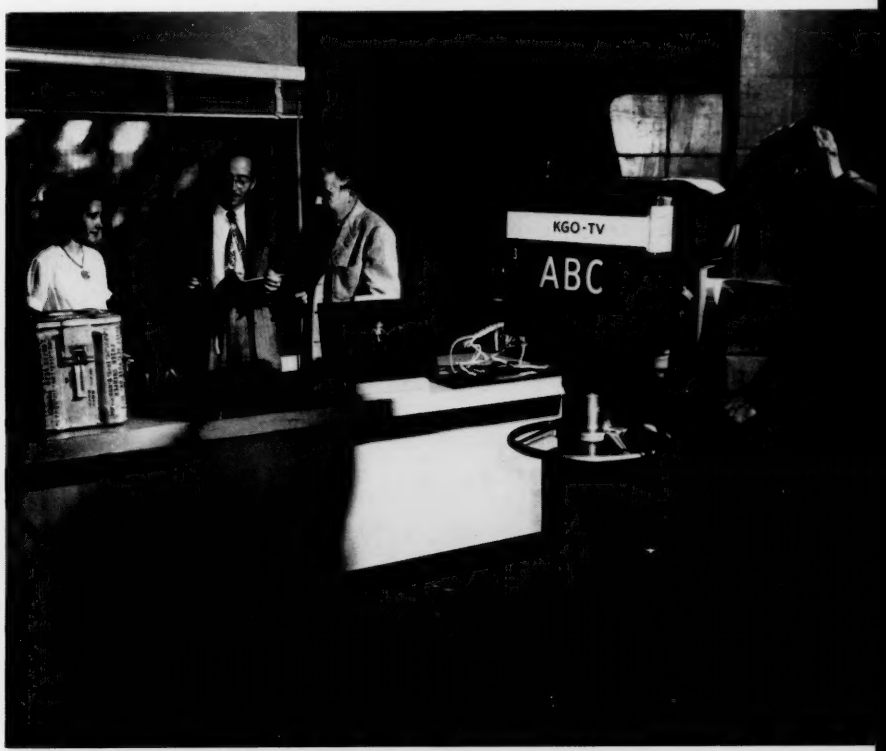
A more immediate issue from this field work will be information about the countries visited, sent directly to *PD*, for publication, beginning early next year, in "Roads to Discovery."

Our second departure is the Academy's adoption, this year, of the newest means of reaching the General Public: television.

It began early in the year when Tom Groody was given a courtesy half hour on a Saturday sustaining program for a period of thirteen weeks. Response was astonishing. A flood of enthusiastic and constructively critical mail convinced the Council, Trustees, and Director of the Academy that a regular program should be tried out, if a sponsor could be found. With this latter role generously filled by the American Trust Company, a Western institution that, like the Academy, is nearly a century old, and with six months of intensive planning done, we took to the air September 23.

Inside the back cover of this issue will be found excerpts from a few of the six hundred letters that came in response to a request for comments on the show. These letters and the many other expressions of hearty popular approval so far received indicate several things. People want better programs than most producers seem to realize, judging by the general output. A science program hits the mark. People are not even afraid of being educated, a fact which may cause some embarrassed surprise in television circles. We purposely set out to make our show entertaining first, educational second. A great many viewers wrote they were grateful for a show, at last, from which they could learn something!

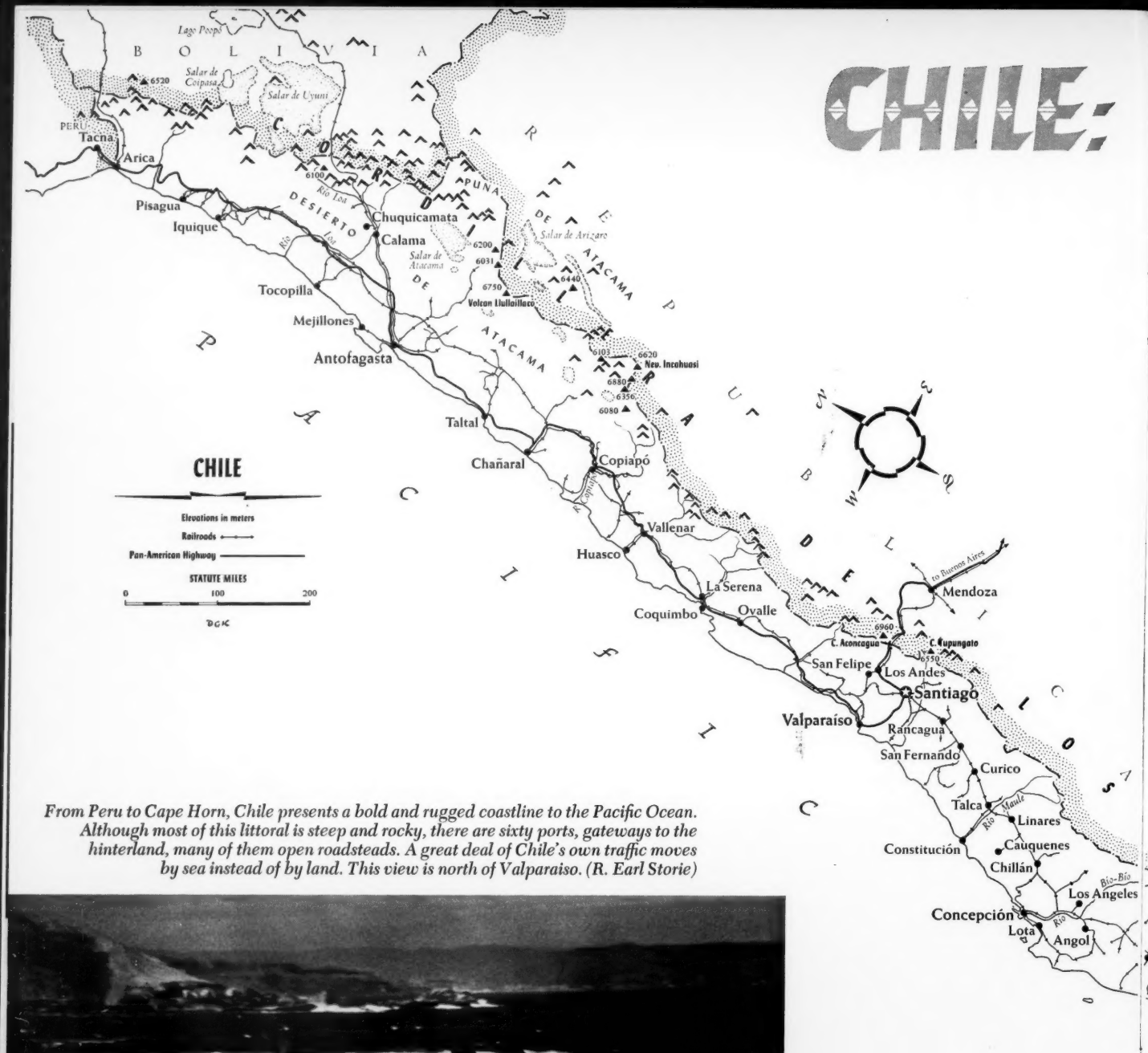
Perhaps the most hopeful signal raised in the path of this pioneer Western science program is the portent of future competition. To survive after the big-time, well-heeled network shows hit town –and there will be good science shows among them–we must make our show better and better. Such competition will raise television's sights. We'll accept the challenge and do our best to stay in front. If a general improvement is in the making, the public may take credit for its deliberate choice of something better when it was offered.



"Science in Action"–Tom Groody, host-narrator on the Academy's TV show, has guest-scientist Dr. Robert T. Orr, Curator of Birds and Mammals, and Research Assistant Mary Lou Perry tell the viewers some facts about bats. Dr. Orr holds a study skin, while a live one waits in the cooler.

Academy scientists have been departing on expeditions since the days of clipper ships. Once they manned their own schooner, the *Academy*, sailing her to the Galápagos Islands and back. Now the Academy uses more modern means–flying clippers, ocean liners, motor vehicles–to get to and travel in the field. In the same spirit we are using TV, latest educational device. We're glad so many took this departure with us. D.G.K.

CHILE:



From Peru to Cape Horn, Chile presents a bold and rugged coastline to the Pacific Ocean. Although most of this littoral is steep and rocky, there are sixty ports, gateways to the hinterland, many of them open roadsteads. A great deal of Chile's own traffic moves by sea instead of by land. This view is north of Valparaiso. (R. Earl Storie)

PACIFIC DISCOVERY

nation with the long reach

C. LANGDON WHITE

CHILE IS HIGHLY COMPARTMENTALIZED. In this, of course, she is not unique; so are the other South American west coast countries – Colombia, Ecuador, Peru, and Bolivia. But Chile differs from them in one respect – they all have hinterlands that extend over and beyond the Andes, whereas Chile lies wholly on the western slope, her regions mostly a matter of latitude. So thoroughly has nature done this job of giving Chile extravagant climatic contrasts that man experiences much difficulty in effectively tying the nation together. Moreover, Chile faces Pacificward: her outlook is definitely *outward* toward other continents rather than inward toward the country itself. In short, Chile is pinned against the sea.

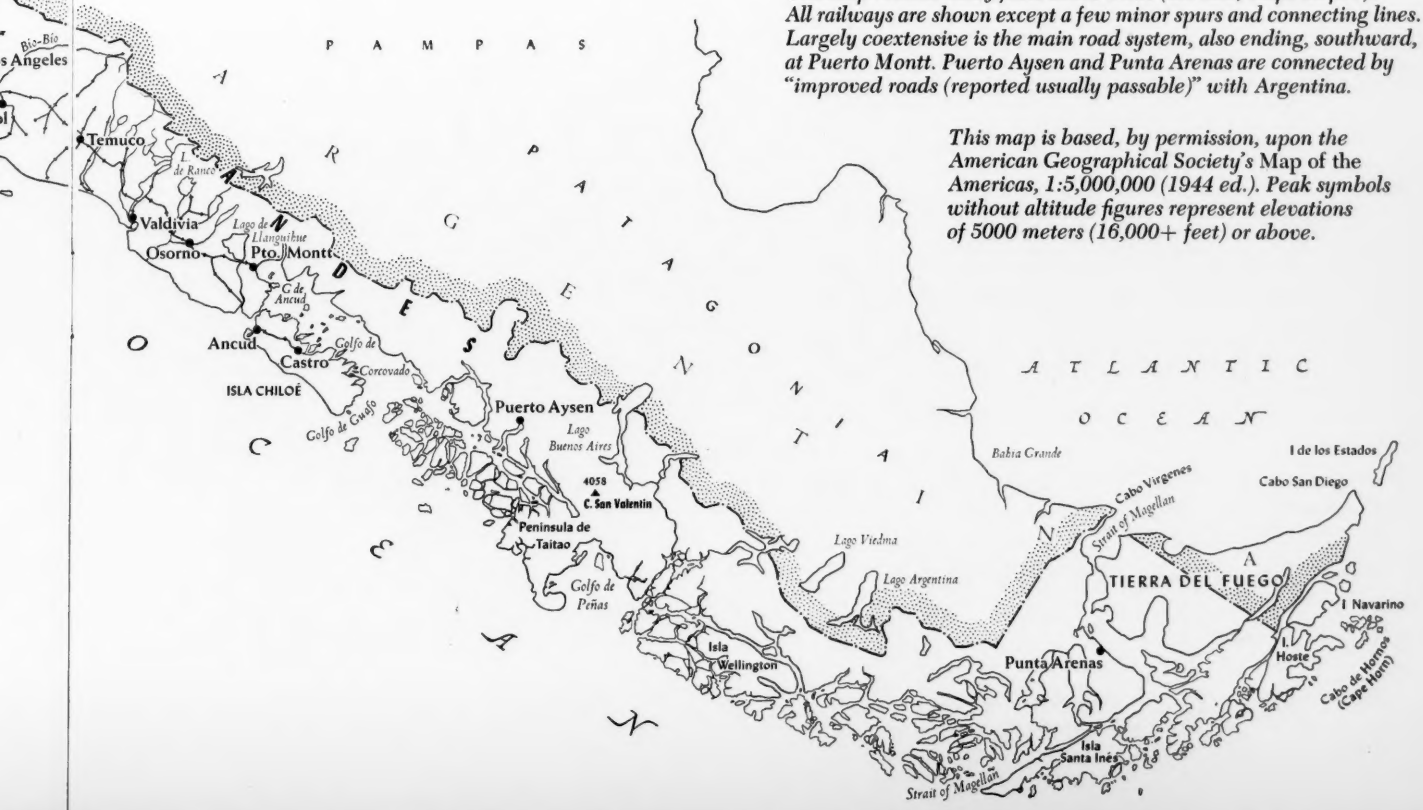
Each of Chile's three sharply defined regions has its own distinctive economy: the arid North is devoted almost entirely to mining, the Central Valley to agriculture and a growing industrialism, and the rainy South to sheep-raising, logging and lumbering, and fishing. A sharper contrast than that between the northern desert and the cold, rain-swept South would be difficult to find.

Chile ranks sixth among the South American nations in size. With an area larger than that of any European nation, exclusive of Russia, with a population of 5,677,000 (estimated January 1, 1949), and with the best-balanced economy in South America, Chile is indisputably one of the continent's leading nations. *But area alone does not reflect the strength and well-being of a nation:* we must know what the country is like, how much is productive, and how well it is able to sustain its population with a decent standard of living. It is in this last respect that Chile is weak, for 90 per cent of the area consists of desert, mountains, and cold, wind-swept, rainy land incapable of supporting more than a mere handful of people. Even much of the Central Valley (the "heart of Chile") is rainless for seven months of the year, which discourages agriculture except where water from the Andes is available for irrigation.*

*In one part of the Central Valley not far from Santiago, the writer saw Holstein cattle subsisting entirely upon thistles. Hardly any water was available to them; the one water hole in the area had almost completely dried up.

The map reveals many facts about Chile (see also, maps on p. 7). All railways are shown except a few minor spurs and connecting lines. Largely coextensive is the main road system, also ending, southward, at Puerto Montt. Puerto Aysen and Punta Arenas are connected by "improved roads (reported usually passable)" with Argentina.

This map is based, by permission, upon the American Geographical Society's Map of the *Americas, 1:5,000,000 (1944 ed.). Peak symbols without altitude figures represent elevations of 5000 meters (16,000+ feet) or above.*



Incas and Conquistadores

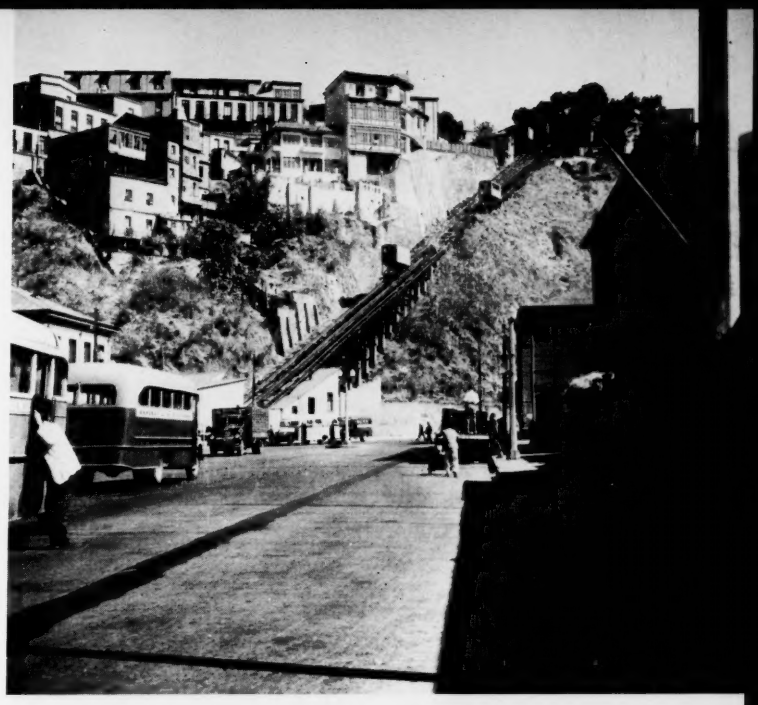
The Incas invaded what is now Chile in the second half of the fifteenth century, and they fixed the frontier at the Río Maule. Unfamiliar as they were with forests, which characterized the country south of this river, their influence beyond it was slight. Diego de Almagro, one of the partners of and the murderer of Francisco Pizarro, was the first Spaniard to venture into the lands called by the Incas "Chilli." This was in 1536. Almagro and his party had nightmarish experiences: coming down from Peru and Bolivia, they suffered from unbelievable cold in the Andes, and from terrible thirst in the desert; they were set upon by Indians, and they found little gold. Thus "Chilli" proved disappointing and barren, and the expedition accordingly returned to Peru.

The next Spaniard to penetrate Chile, and the one who effected the permanent occupation of the country, was Pedro de Valdivia, who set out from Cuzco in 1541. Undaunted by the experiences of Almagro, he made his way into the Central Valley and founded the City of Santiago. For twelve years he pushed southward, building forts and founding cities, as far south as Valdivia. Actually, the Central Valley presented a home-like landscape to men reared in the Mediterranean Subtropical and the Dry Subtropical climates of Spain. But the Indians encountered in Chile were not like those of Mexico, Guatemala, Colombia, Ecuador, Peru, and Bolivia; these were the Araucanians,* who were to fight the Spaniards for three and a half centuries and cause them to lose more blood than they lost in all the rest of Latin America combined. The Araucanians occupied the area west of the Andes from the Río Choapa to the Island of Chiloé. Most of the fighting occurred in the Central Valley between the Río Maule and the Río Imperial. Over the years, as a result of

*The word "Arauco" in Quechua means *cold*, and was applied by the Incas to the people whom they found in Chile.

➔ *Chile: economic zones and annual rainfall. Inset map shows geographical regions and Chile's position in South America. (Courtesy Office of Foreign Agricultural Relations)*

Valparaiso is Chile's second city and chief port. (Courtesy Grace Line)



Built on two levels—waterfront and hills—Valparaiso depends on funiculars to carry its citizens and visitors from one section of the city to another. Except for the outdoor escalator, this scene will remind many readers of San Francisco's Telegraph Hill. Santiago, the capital and chief city, is sixty airline miles inland. (Courtesy Grace Line)

Desert, Mining

Agriculture and Industry

Forest, Pasture, Fishing

almost continuous warfare, of diseases introduced by the whites, and of the hard labor of the *encomienda* system in the fields, mines, and towns, the Araucanians were greatly reduced in number. Many Spanish soldiers and settlers, of course, married Araucanian women; nevertheless Araucanian culture remained fairly intact until well toward the end of the nineteenth century. In 1640 a treaty was made with the Indians by which they were allowed to keep all territory south of the Río Bío-Bío.

The three centuries comprising the so-called "colonial period" are divided into three periods: (1) the sixteenth century was a war-like period in which the Spanish *conquistadores* struggled against a hostile Nature and against hostile Indians. Nevertheless, political organizations emerged and twelve cities were founded. Financially, Chile was a loss, for gold production there was unimpressive; (2) during the seventeenth century, Chile passed from the iron hands of the *conquistadores* into the feeble power of intriguing courtiers and newcomers. In addition, several calamities beset the nation – the horrible earthquake of May, 1647, that killed almost one-fourth of the population,

This cheerful housewife with her distaff, at the door of her suburban home near Temuco—"the Araucanian city"—represents a virile race. Ancient inhabitants of the Chilean valleys, the Araucanians stood off Inca and Spaniard both. It took the European invaders a long time to overpower them at heavy cost in life and property. Under the slow process of assimilation, the Araucanian's sturdy qualities have been a prominent factor in developing a high type of Chilean mestizo. Araucanians are good farmers, skilled weavers and basketmakers.

epidemics, and repeated sackings by freebooters. Economically considered, the era was progressive, for the quest for gold subsided and the colonists began to engage in other enterprises, particularly agriculture. In short, the seventeenth century represented material progress; (3) in the eighteenth century, a period of peace and prosperity began, bringing a cultural renaissance.*

In 1810 came the revolt against Spain – a logical step to be taken by people living in a region so distant from the center of political power; the area had to be self-reliant or perish. Moreover, the mother country had left it much to itself, for it was small in size and was poor in gold and other precious metals.

The War of the Pacific. From 1879 to 1883, Chile was involved in the War of the Pacific, in which she fought both Peru and Bolivia, emerging victorious. The war resulted from disagreements over the nitrate deposits of Tarapacá and Atacama. Chilean companies had been working the deposits which belonged to Peru and Bolivia. The boundary between Chile and Bolivia, like many others in South America, had been indefinitely determined. In 1878 the Bolivian government imposed a new tax on the exploitation of nitrate in the Atacama; the Anglo-Chilean Company, chief producer, refused to pay it. Accordingly its property was seized by Bolivian authorities. Chile retaliated by occupying Antofagasta in February, 1879, and shortly declared war on both countries.

Because Chile had a better trained and better equipped army and navy, she won the war – largely a naval war. This resulted from the fact that the Atacama is one of the greatest deserts in the world – 1,600 miles of it where land travel is arduous and costly; the sea is the great highway here. Chile emerged from the War of the Pacific as one of the richest and most powerful of the South American republics. Her new acquisitions contained valuable deposits not only of nitrate but of copper and other minerals as well.

*Eduardo Solar Correa, *Las Tres Colonias*, Santiago de Chile, Editorial Zamorano y Caperan, 1943.

The country with the long reach

Chile is unique in many ways, but most of all in her shape or form (see map). A long, thin, shoestring land, she is 2,600 miles in length and averages only 110 in width. *She is about twenty-six times longer than wide.* This extreme proportion is both an asset and a liability. With the high ratio of coastline to area, no part of the country lies far from salt water and ocean transportation. Thus the nation is served by some sixty ports. Yet there is weakness in this very number, since commerce in most is inadequate to justify expensive port works and almost without exception the harbors are either open roadsteads or unimproved natural harbors where ships must anchor some distance from shore, transferring cargo and passengers to and from lighters. Moreover, some of the ports in the desert have existed only because of the nitrate

industry, and since nitrate production has fallen off, a number of them have desiccated.

A country with so long a reach is hardly adapted to being governed from a central seat. Chileans in the north and south consider themselves badly neglected by the legislators at the capital. This results because their needs are not comprehended by the officials in Santiago who know neither the arid North nor the rainy South. Too often lavish appropriations are made for ill-advised public works in the Central Valley while much-needed improvements are refused to those in the North and extreme South.* It is small wonder that government has been expensive and inefficient.† One of the major reasons for Chile's construction of the 1,900-mile-long Longitudinal Railway was to try to unify the country.

The people: What is a Chilean?

Racially, the Chilean of 1950 is the product of a mixing of two indomitable peoples – the Spaniards and the Araucanians. Chile is thus predominantly *mestizo*. Only about 5 per cent of the population now consists of pure-blood Indians; the number of whites of unmixed ancestry is placed at 20 to 30 per cent. The remaining 65 to 75 per cent are a mixture of Indian and Spanish in varying degrees. The Chilean *mestizo* group differs from the other *mestizos* of Latin America in that it is nearer the Spanish side of the mixture than the Indian side. So long has it been since the more prominent families have had Indian ancestors (six or seven generations) that some authorities regard Chile as predominately white.

The Chilean mixed-blood is more virile and energetic than the *mestizo* born of the mating of Spaniard and Quechua. The Chilean laborer is noted for physical strength, endurance, bravery, and a spirit of independence. Precisely why this is so is not known for certain, but it is believed that invigorating climate, better diet, and superior racial inheritance all are involved.*

Differences in population in Chile are based far more on economics than on race. The great families – the overlords – live in an economic world far removed from that of the *roto*, the *inquilino*, or even that of the rising middle class. As in most Latin American countries, the masses live in extreme poverty (the national annual per capita income in a recent year was only $106, U.S., but

*"Chile has never had a president, I think, who did not have a farm and spend a part of his time on it. Her Congress is made up chiefly of rich landlords. Social life is dominated by families whose proudest possession is an ancestral estate. All the elite have rural properties. This means that the social and economic life as well as the political life of the country has been dominated by the *hacendado*." (George M. McBride, "The Agrarian Problem of Chile," *Geographical Review*, Vol. 20, 1930, p. 574).

†W. E. Rudolph, 'The New Territorial Divisions of Chile," *Geographical Review*, Vol. 19, 1929.

*Preston James, *Latin America*, Odyssey Press, New York, 1942, p. 230.

The sheepherder of Chilean Patagonia knows how rigorous life can be in Chile's southern frontier regions. The warm sunshine and blue skies of Middle Chile give way to strong winds, drenching rain, and much overcast sky. But hardy Chilenos and foreigners are developing the southern grasslands, forests, and fisheries. (More about the South in a later issue.)

in 1949 the Chilean worker was getting the highest wage in South America—approximately $840 a year). Obviously the masses have little in the way of the world's goods.

Regions of Chile

The best way to understand Chile is to know each of its regions. Each has a distinct climate, topography, and economic development.

A. The Dry Mining Desert. This northern region is one of the most distinct natural divisions in all South America. Here is one of the world's few deserts where rain is almost unknown. The Atacama is a region of indescribable barrenness. From the water's edge the cliff escarpment of the Coast Range rises unbroken for 2,000 or 3,000 feet. In the whole stretch of 600 miles, only the Río Loa successfully reaches the Pacific Ocean. Protected natural harbors are lacking. On the narrow wave-cut terraces, which result from the gradual emergence of the land, are the towns of Pisagua, Iquique, Tocopilla, Mejillones, Antofagasta, Taltal, and Caldera. East of the Coast Range lies a series of dry basins or *bolsones*. Enormous alluvial fans spread out over the eastern part of the basins. In the geological past these basins probably contained lakes, and it is in the low parts on the west side that the deposits of nitrate are found. While northern Chile is poor in cultivated land, it is rich in a number of minerals. A Chilean stated the situation well when he said, "On this land, narrowed down by the mountains and by the sea, mine operators encounter no limit in the depth of the earth."

It is thus in the northern region that most, though not all, of Chile's mining is carried on. Mining long has been the mainspring of the nation's economic activities and the largest source of government revenue. In fact, there would be no motive for human occupance of this biological vacuum were it not for the mines. Mineral products represent 55 to 65 per cent of the total production of raw materials, and copper and nitrate alone supply about 75 per cent of Chile's exports.

Fortunately for Chile, as a result of her long reach, the mines are located close to the ocean, and transportation of the mineral output and of supplies and equipment is both cheap and easy.

Chile ranks first among the South American countries in the production of coal, copper, iodine, iron ore, and nitrate; second in gold; and fourth in silver. The nation also yields appreciable quantities of borax, cobalt, lead, zinc, manganese, mercury, molybdenum, sulphur, and tungsten.

Nitrate. For many years — from 1883 to 1913 — the words *nitrate* and *Chile* were synonymous. This valuable element for the agricultural fertilizer, explosive, and chemical industries meant much to her, for the market was immense, and she held a tight monopoly. Shortly before the outbreak

Chile's wealth was in the desert in the booming days of nitrate. This is an air view at the edge of the Salar de Pintados. Near the center is a typical nitrate oficina, with its extraction plant (dark) in the center, its group of buildings, and its large, flat-topped waste dumps. The nitrate diggings are the rough areas at the base of the hills. They are not in the salt-incrusted salar but entirely on the lower slopes of the hills around its borders, up which they extend for a vertical distance of more than 100 feet above the level of the salar. (John Lyon Rich)

The world's largest copper mine, at Chuquicamata, Chile, is a two-mile open pit 10,000 feet above sea level in the Atacama Desert. Its more than 15 benches average 40 feet in height. Sixty to 250 holes are blasted at a time, with 50,000 to 200,000 tons of ore broken out per blast. More than 64,000 tons of material are transported daily—46,000 tons ore, 18,000 tons waste. More than 445,000,000 tons of raw materials had been extracted up to 1950. (Courtesy Anaconda Copper Mining Company)

of World War I, however, a commercial competitor loomed on the horizon in the form of synthetic producers using the Air-Nitrogen Process, and by 1913 had reduced the 100 per cent monopoly to 55 per cent of world consumption. The four years of the conflict further encouraged the development of synthetic nitrate in factories, and after the Armistice, German and other production cut the Chilean share of the world market to a third. By 1927, many countries were making so much of the synthetic product that Chile's share had fallen to 25 per cent; in 1932 and 1933 it had fallen to 10 per cent – prices were kept so low that she could not compete; her economy was shaken to its very foundations. It was not easy for a nation that had enjoyed a 100 per cent monopoly for so long and had operated her government largely on the income from this single source to grasp the true nature of the problem. There was a great exodus of workers from the desert to the cities; many of the nitrate settlements became ghost towns, and political upheaval ensued: in a single year, nine governments changed and there were strikes, a fleet mutiny, insurrection, exiling of politicos, and conspiracies of army officers. But the cause was much deeper than politics. Cheaper extraction from the air and the saving of large amounts of ammonium sulphate in by-product coke ovens had destroyed Chile's monopoly. Moreover, the great powers were subsidizing the synthetic plants in their own countries. Chile's determination to continue as a factor in the world's nitrate business, however, is indicated by her slashing of prices $3.00 per ton late in 1949.

So dry is the nitrate region that there is no water, no vegetation, no source of building materials – in short, nothing for maintaining settlements; *everything must be brought in from the outside.* Yet the deposits of nitrate of soda are so soluble that they would probably be completely

removed within a few decades of even moderate rains.

The nitrate occurs as a cementing constituent of the crust formed close to the surface of the desert by the precipitation of salts carried upward by ground water. The nitrate-bearing *caliche*, containing up to 30 per cent nitrate, ranges from a few inches to several feet in thickness, and from a foot or two to ten or more feet below the surface.* Diggings follow the richer streaks of *caliche;* after blasting, electric drag lines remove the overburden and power shovels dig up the *caliche*, loading it into cars which deliver it to the treatment plants (*oficinas*) where the crystallized nitrate is made. A new process, the solar-evaporation, is now in use and is far more efficient than any of those employed in the past.

Nitrate meant so much to the economy of Chile that year after year the government, by reason of its export tax of $10 to $12 per ton, had a royalty income of around $25,000,000 which contributed up to 68 per cent of the cost of operating the government. This relieved the ruling class, the *hacendados* of the Central Valley, of the necessity of imposing sizable taxes on themselves. Accordingly they could retain on their vast estates a medieval economy – with virtual serfs as labor. With the invasion of synthetic nitrate and the collapse of natural nitrate, Chile was forced to make in a single leap, and in a few years' time, an adjustment such as other countries are able to make over a period of many generations. It was from the depth of that collapse that present-day Chile must be judged. This was a major accomplishment, for which the nation deserves much credit. "To a less virile people the thirties would have spelled the end."

Copper. While Chile ranks second in world copper production, the industry as an international factor is not of long standing. There was no large-scale activity during the Conquest, since Spain possessed at home the famous Rio Tinto deposits. In the eighteenth and nineteenth centuries, Chilean copper mining grew in importance, but became a great industry only in the twentieth century.

Chile is world-famous for three great copper mines, one of which, Chuquicamata, is reputed to be the largest copper mine in the world. It is also a model mine and camp.

Chuquicamata lies in the Atacama Desert about 147 miles northeast of Antofagasta. An open-pit mine, it sits atop the world's largest known deposit of copper ore. Though known even to the pre-Incas, it never really amounted to much because of the low quality of the ore – about 2 per cent metallic copper. It became a great mine only in 1913, when an American company with much experience in mining low-grade ores, and with enormous financial reserves, took over. It brought in water by three pipelines from sources 36 and 55 miles away, and it built a power plant at Tocopilla, on the coast 87 miles distant; from here the power generated from petroleum was sent to the mine and to crushing, electrolytic and smelting plants by a costly transmission line. Investment in mine plants and in the development of the low-grade ore cost in excess of $350,000,000. Only strong and experienced companies can operate profitably a deposit like that at Chuquicamata. For the most part, Chileans, along with nearly all Latin Americans, have been reluctant to put their money into mining ventures, but the mining industry, given favorable conditions, can continue to contribute to Chile's economy for many years.

Future of Northern Chile. The future of the northern desert is not bright. Both the region and the entire country suffer from chills and fever as a result of too-great dependence on minerals. The future of Chilean nitrate is insecure, for costs of production are high and the margin of profit small. In the past year, Chile suffered serious setbacks as a result of a fall in the world price of copper and nitrate.* Moreover, mining is a robber industry, and ultimately the copper, nitrate and other minerals will be gone. Also, Chile is a high-cost producer, experiencing difficulty in competing with countries more favorably situated. In spite of the importance of mining in Chile, the number of persons engaged is only 6 per cent of the total gainfully employed; yet 75 per cent of the country's foreign exchange receipts are derived from mineral exports.

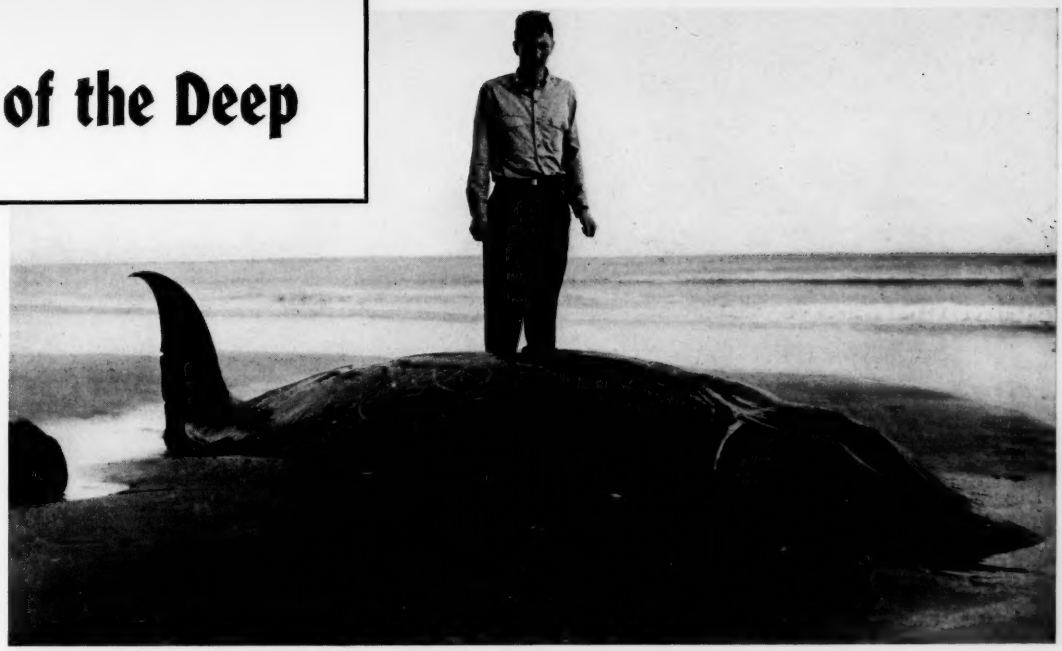
(To be concluded)

*Many theories have been advanced for the formation of the nitrate deposits. These are presented interestingly in B. L. Miller and J. T. Singewald, *The Mineral Deposits of South America,* New York, 1919.

*The price bounced back later, however.

Rarity of the Deep

ROBERT T. ORR



Discoverer Woody Williams, 6 feet, 160 pounds, and his discovery, Mesoplodon (accent OP), 16 feet, ? tons. (Don Greame Kelley)

In the year 1579 the *Golden Hind* dropped anchor off the coast of Nova Albion and its occupants led by Sir Francis Drake came ashore on a sandy beach backed by moderately high bluffs, reminiscent of those of southern England. If we read "The Famous Voyage . . ." which is contained in Richard Hakluyt's *The Principal Navigations, Voiages and Discoveries of the English Nation . . .*, printed in London in 1589, we find that Drake and his party were met by friendly Indians when they landed. There is comment on the great herds of large deer and another animal which is described as "a strange kind of Connies, their bodies in bignes as be the Barbarie Connies, their heads as the heads of ours, the feete of a Want, and the taile of a Rat being of great length: under her chinne on either side a bagge, into the which she gathereth her meate, when she hath filled her bellie abroad."

Historians have generally agreed that Nova Albion was the Point Reyes Peninsula whose curving southern shoreline enclosed what is presently known as Drakes Bay in Marin County, California. The large deer occurring in herds were likely the Roosevelt elk which formerly roamed over this area. The identity of the "strange kind of Connies" has been a mooted question for many generations. It has been variously identified as a rabbit, partridge, ground squirrel, and pocket gopher, although the writer is convinced that the last-mentioned identification is likely the correct one (see *Journal of Mammalogy*, vol. 31, 1950, p. 362).

If Drake had landed at about the same place on March 19, 1950, he would no longer have found the friendly Indians nor the elk, although the pocket gophers would still be on the bleak moorlands behind the bluffs. His diary, nevertheless, might have contained an account of another strange animal almost as little known to the scientists of today as were the "strange kind of Connies" to the Elizabethan explorers. On that particular date, however, Woody Williams of Inverness, who is well-known to *Pacific Discovery* readers, and Don Greame Kelley, editor of the aforementioned magazine, were picnicking on Drakes Beach with their families. Perhaps inspired by the thought that a great explorer had walked the very same shoreline three hundred and seventy-one years earlier, Woody and Don walked westward along the beach to see what they could find. After a mile or so of beachcombing they were rewarded for their efforts. Woody sighted what at first glance appeared to be a porpoise or dolphin washed up on the shore. Closer inspection revealed a rather weird, whale-like creature about 16 feet in length and weighing several tons. Its head reminded one

Mary Lou Perry, from whose specialty, bats, nothing could be farther removed than whales, dutifully holds the tape while the author unwinds it towards PD's *editor. Sticks are held at right angles to the long axis of the animal, which is too long for calipers.*

vaguely of that of a rhinoceros. It possessed low set eyes, a hump where its nose should be, and an outthrust lower jaw containing two large tusks.

Suspecting that this was a member of the rarest family of living whales, Woody phoned the writer that evening. After a hurried long distance conference we were in complete agreement on this point and made arrangements to work on the animal the next day, provided it had not washed out to sea in the meantime. By work I mean obtain as many different measurements as possible, save the skull and certain other parts of the body and, last but not least, secure a number of good pictures. Don and Woody had taken a few pictures that afternoon and the next morning a dark room rush job at the Academy enabled us to be fairly certain that not only was our whale a beaked whale of the Family Ziphiidae but that it belonged to one of the rarest genera, the genus *Mesoplodon.* When Miss Mary Lou Perry, research assistant in the Academy's Department of Birds and Mammals, Don, Woody, and the author arrived at

Photographs by Woody Williams

← *The black slit of the whale's blowhole shows plainly just back of the white hump on top of the head.*

→ *A broad, flattened tusk projecting upward from each side of the lower jaw gives a formidable appearance to the sharp beak which is the hallmark of the family Ziphiidae.*

Drakes Beach our prize was still there, although the waves had turned it over during the night, and all doubt was dispelled regarding its generic identity. Indeed it was *Mesoplodon* and the Academy would now have in its collections skulls of three of the four or five recognized genera of beaked whales. We already had *Berardius* and *Ziphius* but lacked *Mesoplodon* and *Hyperoödon.**

Whales, as the reader may know, are separated into two major groups. One of these comprises the whalebone whales which have plates of baleen in their mouths instead of functional teeth and possess paired blowholes on the top of the head. Most of these animals are of very great size. The blue whale which is the largest animal known, past or present, is a member of this suborder. The second group consists of the toothed whales which lack baleen in the mouth and possess but a single blowhole. Most of these whales are of small or medium size, the sperm whale or cachalot being the largest species and the porpoises and dolphins, the smallest. There are six currently recognized families belonging to this group including the Family Ziphiidae (beaked whales) which contains most of the rarest species. Most members of this family have but one or two pairs of teeth which are in the lower jaw, and the muzzle is prolonged into a beak-like structure.

The accompanying pictures illustrate, better than words can describe, the appearance of our whale. The body was black, except for most of the beak, the hump on top of the head in front of the blowhole, and parts of the flippers. The body was marked by numerous scars, however, which were of two types. One was circular or oval in nature and measured 2 to 3 inches in diameter or length and the other consisted of numerous long gashes which criss-crossed one another. Although these may all have been battle scars, the presence of ridges radiating from the center of the round or oval marks made us suspect they were produced by barnacles which frequently attach themselves to whales. Perhaps such annoying commensal attachments cause these small whales to rub against rocks to dislodge their unwanted riders, thus producing the long gashes.

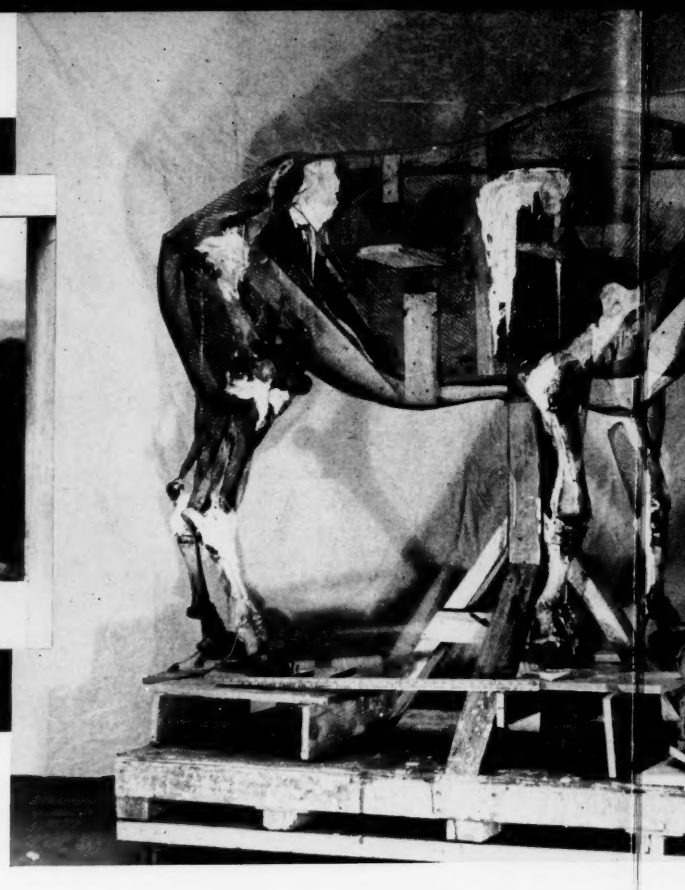
It was well past sunset when we had completed what we thought was the major work in the field. We were wet, bloody, and tired but the anatomical parts that we wanted, including the skull which had been roughed out and reduced in weight to about 150 pounds, were ready for transport back to the car. This turned out to be one of the most difficult tasks of the day. It was a distance of only a little over a mile but when you are tired, try pulling a whale skull over the sand, in addition to carrying cameras, axes, saws, knives, field glasses and numerous other impedimenta. By the time we reached the car we felt that perhaps we had misidentified our animal. It felt like a hundred-ton blue whale. We later had the satisfaction of knowing, however, that our work had not been in vain because this animal proved to be one of the rarest of living mammals. END

*A fifth genus (*Tasmacetus*), of somewhat uncertain relationship, was described from New Zealand in 1937 by W. R. B. Oliver (*Proc. Zool. Soc. London*, vol. 107, pp. 371-381).

Deceptively easy looking, but try this on a mile of rock-strewn wet sand after a hard day's work. The other two whalers were heavy-laden with gear — no one did any serious beachcombing on the way back.

Frank L. Rogers

1



"BUT I DON'T SEE HOW THEY STAND SO STILL!" Mother said to Son, 14, as they came out of African Hall. "But, mother," the attendant heard the boy reply, "they're stuffed, I tell you, they're stuffed!" Awe, amazement, incredulity, admiration are all reflected in visitors' comments as they go out past the checkers at the doors of

CECIL TOSE & DON GREAME KELLEY

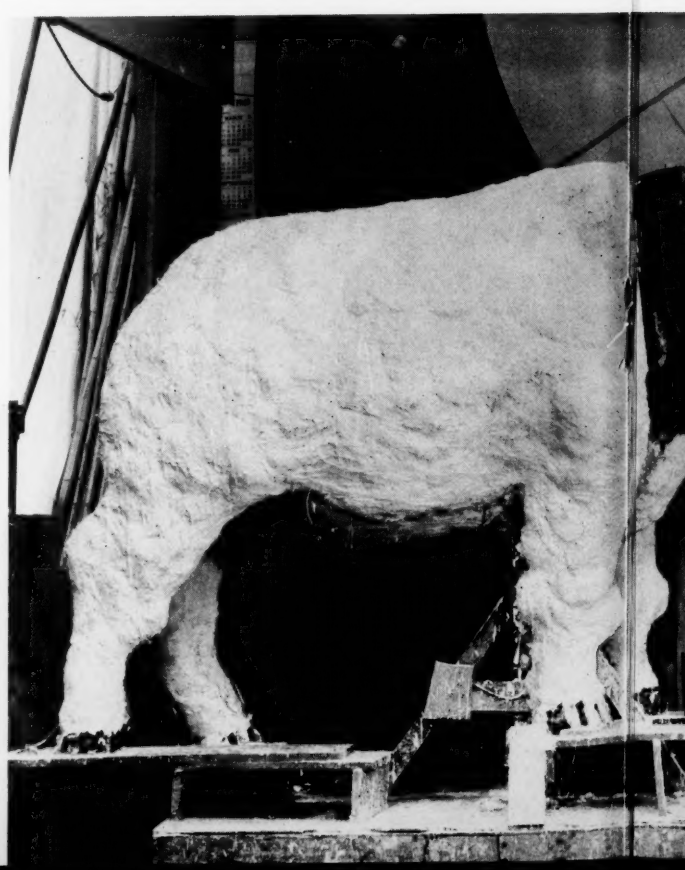
Bringing Them Back "to Life"

African and North American halls. Of course, it was the mother who unconsciously complimented the preparators of the habitat groups, the boy who unknowingly voiced a common misconception—holdover from past museum days. It was the great African game hunter, photographer, naturalist, inventor, Carl Akeley, sick of "stuffed animals," who developed the new techniques.

Fulfilling Leslie Simson's dream of a hall of African wildlife, the new addition to Simson African Hall is nearly completed. Dominant habitat group is that of the Cape buffalo, called the world's most dangerous game animal.

Work begins in the field. Right after the kill, measurements, photos, and drawings are made, to be sent home with the skin, skull, leg and other bones. Action photos of the live animal are very important (10). In the museum the group is planned on paper and a scale model made, with lifelike clay animals, foreground roughed in, background sketched in color, if possible by the artist who will do the big one (1). This diorama is worked over and over until the final result will truthfully represent the natural scene.

When an animal's pose is decided, we make an armature, using leg bones, any others we have, and the skull, attached to a frame of wood, iron rods, wire, rough-shaping the body with wire mesh (2) thinly coated with plaster and shellacked. With constant reference to measurements, photos, field notes, we now model over this in clay, just as a sculptor does for a bronze statue (3). Muscles



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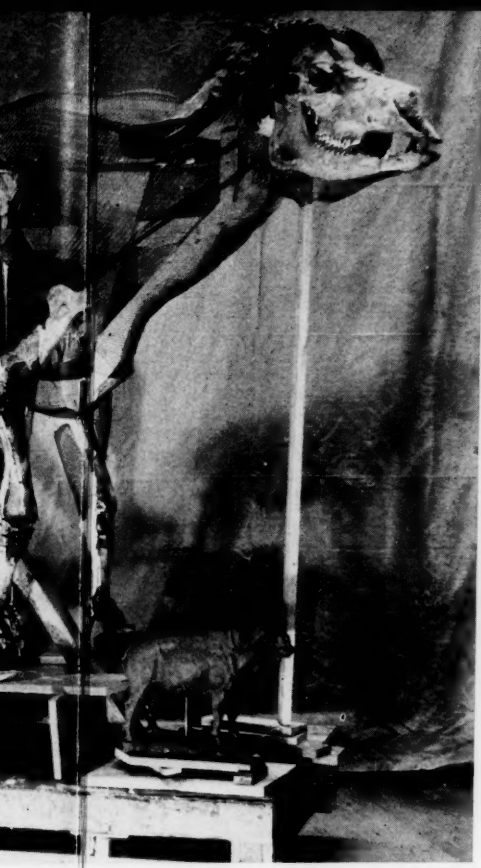

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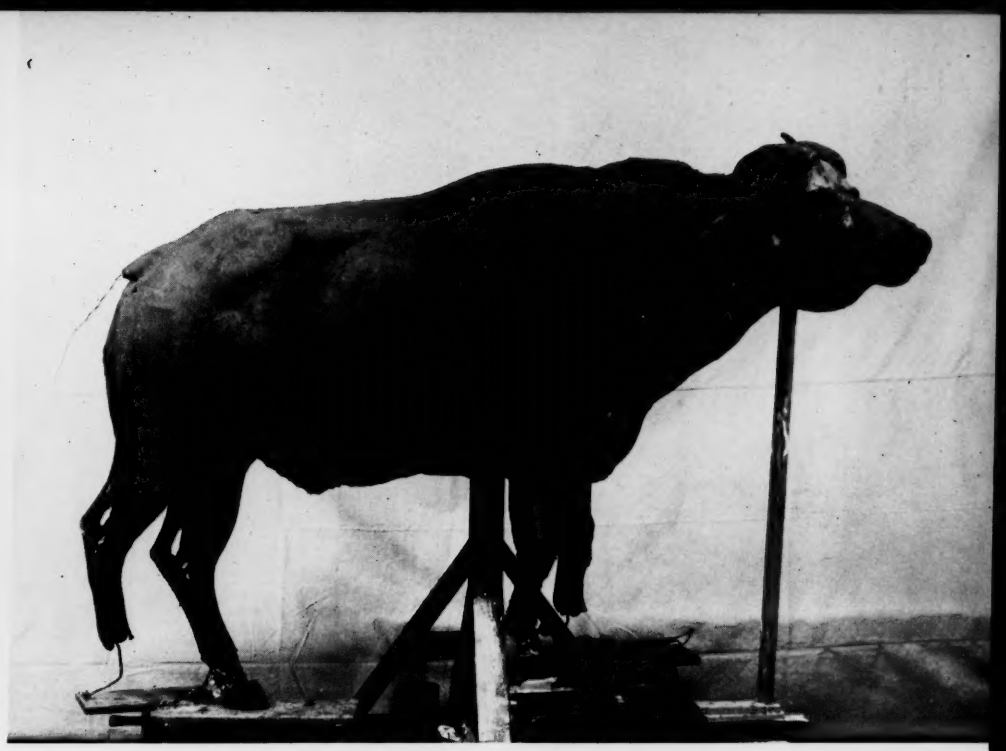
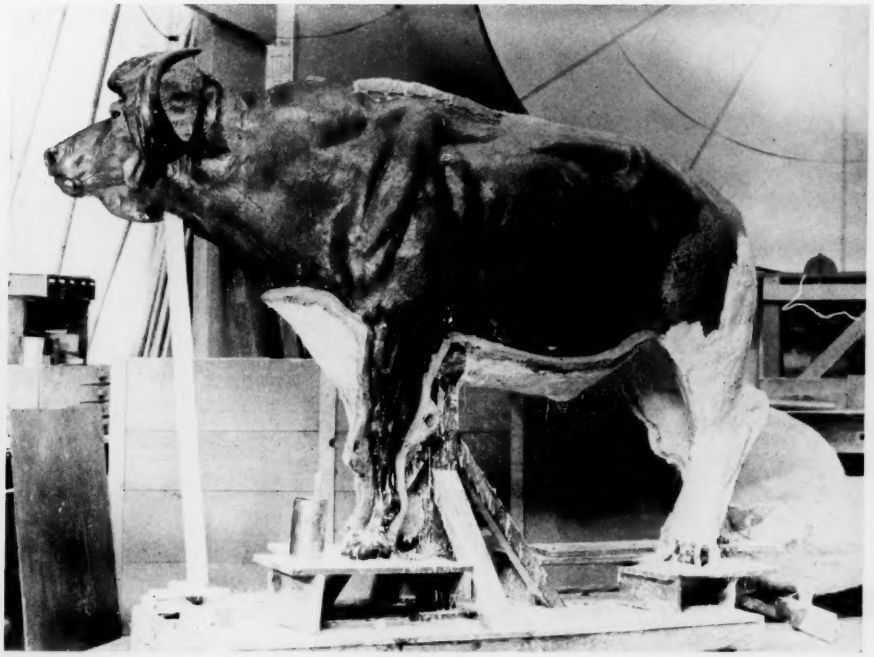


3

must be accurately placed, properly flexed or extended in action or in support of weight. The animal must "look alive" at this stage. Last chance, now, for changes—note (4) that we moved the hind legs after rechecking the big bull's position in the group and angle to the viewer; and that we replaced the broken horns with a near-record pair from the American Museum of Natural History. During this stage we try on the skin several times for fit. By means of clay

Photographs by Toshio Asaeda unless otherwise credited

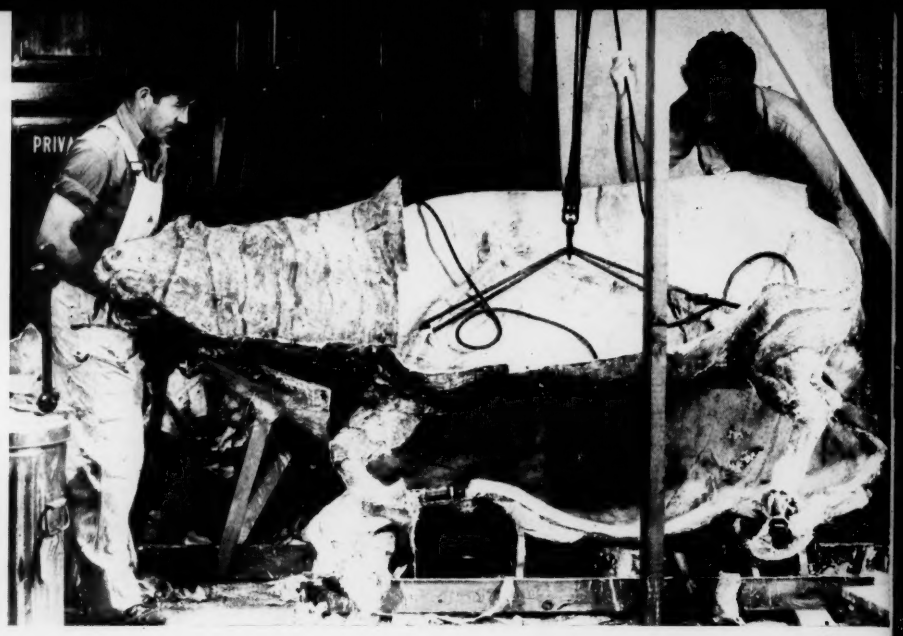


5

walls we divide the surface of the finished model into areas and apply plaster reinforced with burlap to one area at a time; we remove the clay wall, shellac and grease the plaster edge before applying an adjoining section (4,5). This makes a complete shell of several easily separated sections, yet the model is destroyed as we remove them. The dry mold sections are sized with glue, but not reassembled; fine burlap is glued into every contour. Layers of plaster-soaked burlap are applied, leg bones replaced by iron rods or pipes, bent to

Enlarged stills from a 35-mm. film taken during an African game expedition helped the preparators "re-create" the buffalo. Besides animals, the field expedition must photograph vegetation, rocks, landscapes. Artists' color sketches and, in recent years, color photographs are among the sources most valuable to the preparator. (Courtesy James Clark, American Museum of Natural History)

10



6

shape. When set, these thin new forms are steamed free and lifted out of the mold (**6**). They are joined together and the joints are reinforced. We now have a hollow, light, and practically indestructible "manikin," a perfect replica of our clay model. After fixing it to the base with the ends of the leg rods, trimming and shellacking it, and finally fitting the hoofs and horns, we are ready to mount the skin.

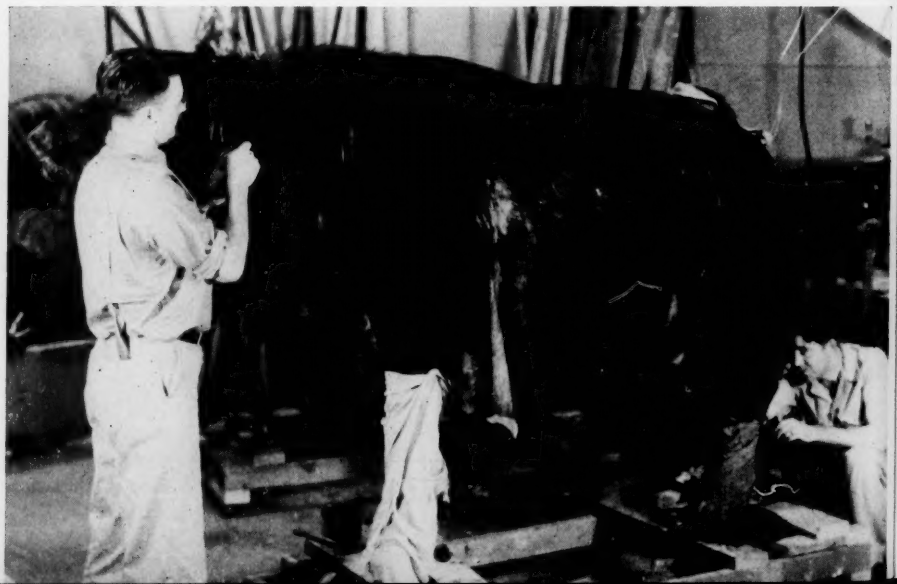
8

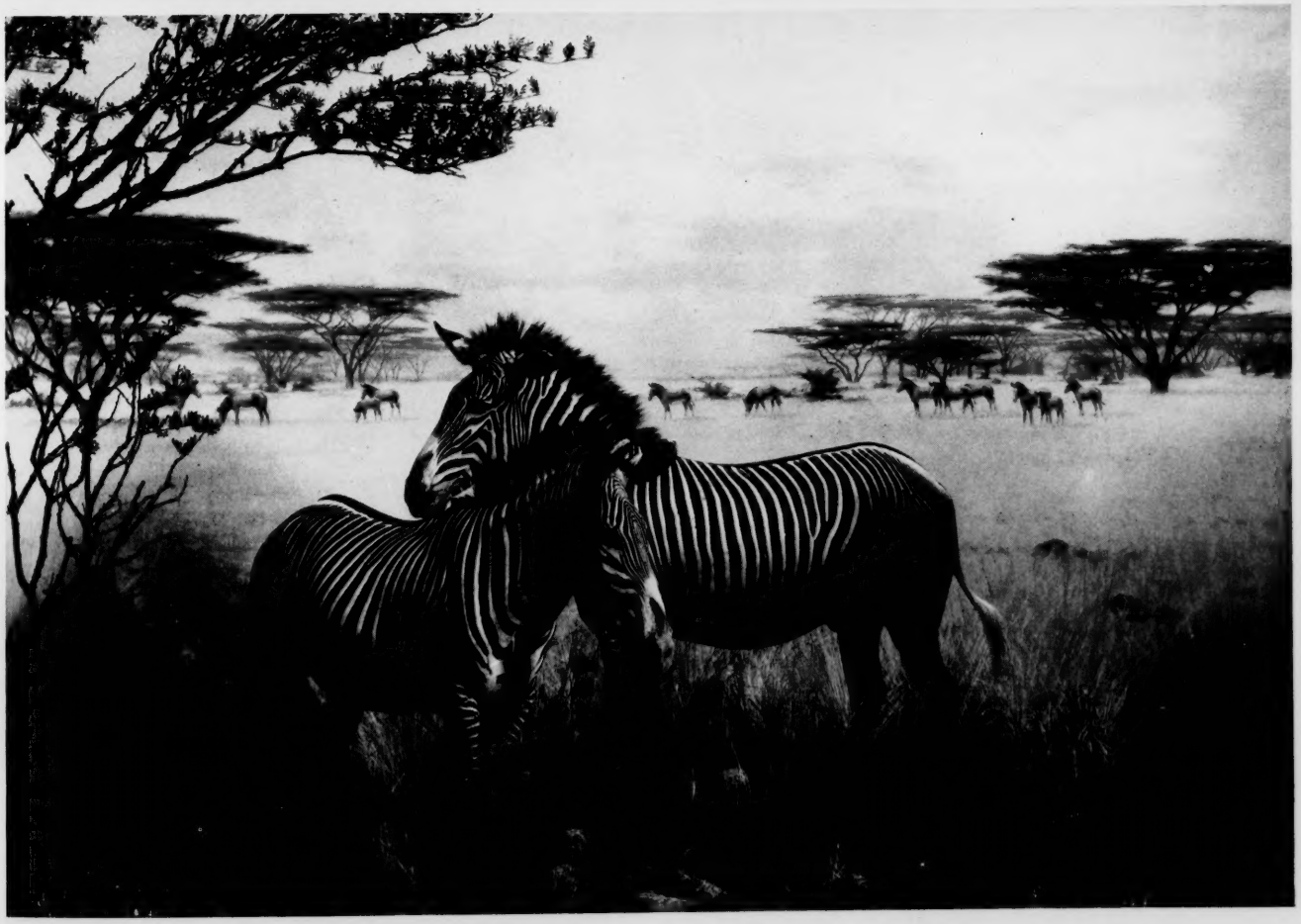
That is now soaked in an arsenic solution to repel pests. Paste is applied to the manikin and to the inside of the softly tanned skin, which is put on wet, worked and sewn into place (**7**). While it is still plastic we model fine details, such as wrinkles in and veins under the skin. Last, we put in glass eyes, wax and color the lips, nostrils, and eyelids—not forgetting the final touches of moisture always present on these surfaces in life—and let the animal dry.

As this issue went to press, the two bulls, cow, and calf of the Cape buffalo group were assembled in their ultimate exhibit space (**8**). Toshio Asaeda, artist and photographer on many expeditions, has done the papyrus stalks and other large swamp vegetation of the foreground; Belmore Browne, painter, mountaineer, big game hunter, has begun to sketch in the background on curving white plaster. We shall describe the making of accessories and background in a later issue. The Grevy's zebra group (**9**), a favorite with African Hall visitors, shows how far from the old-fashioned "stuffed animals" Carl Akeley's techniques have brought us. No wonder a small boy said to someone coming in: "It's just like the zoo—there's animals in there!"

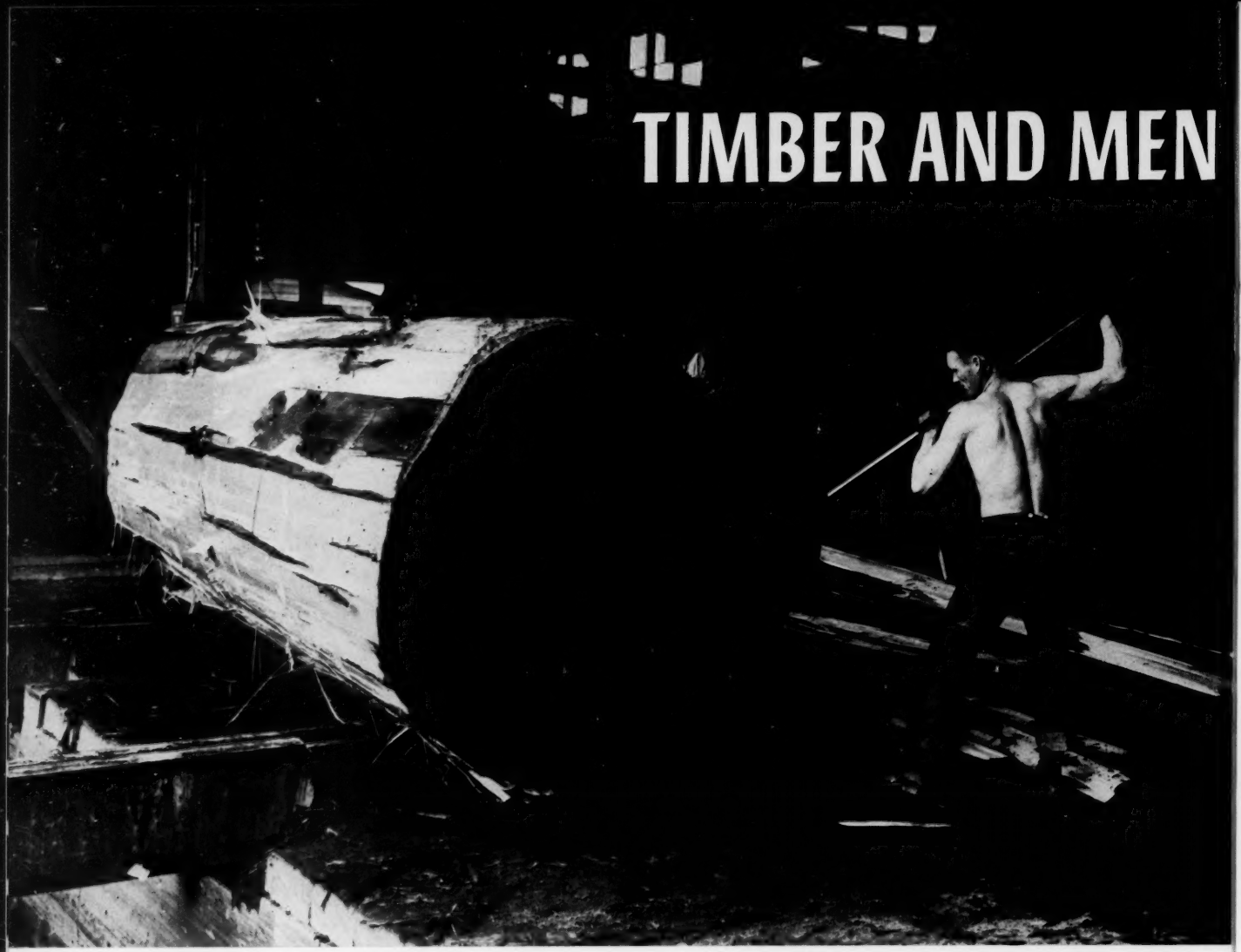
9

7





TIMBER AND MEN



Stripping bark from a redwood log at a Humboldt County mill. (Redwood Empire Association)

EMANUEL FRITZ

MANKIND, THE WORLD OVER, has an abiding love and admiration for forests. In Americans that affection is particularly deep-seated. Yet Americans were exceedingly slow to recognize that they could not with impunity continue to be profligate and careless in the use of their forests. They were slow also to learn that forests can be replaced, that they can be handled like a crop. These truths have gradually sunk in and we are at the beginning of a new era in forest management.

In the West we are exceedingly fortunate. Our awakened interest in wise forest use and replacement comes while we still have a large part of the original forest. This gives us an opportunity to convert the old-growth stands into lumber, poles, pulpwood, and other products according to a plan designed to bring about quick natural replacement. It is this cutting according to a plan that distinguishes modern lumbering from the cutting of the past when no thought was given to replacement.

Planned forestry

This change from what has often been called forest devastation to planned forestry began shortly after World War I. It grew very slowly at first. Although full speed has not yet been reached

— What is the Future of Western Private Forestry?

there is every reason to believe that the acceleration will continue until eventually we will be growing as much timber each year as the land can produce. If the optimists are right, no one need worry about a surplus. This will be one surplus that need not be stored in warehouses to spoil before it can be used. The trees can be left in the forests where they will continue to grow. Such a situation would be almost ideal because it would permit the owners to hold certain trees or stands on longer rotations for producing the highest quality of lumber—the kind produced by the original forest.

How fast are we using our timber?

Americans are using lumber and similar sawn products at the rate of 34 billion board feet per year. This is at the rate of 212 board feet per capita for a population of 160 million. In addition we use 20 million cords of pulpwood per year. The development of substitute materials may reduce the per capita lumber consumption, but as population increases, the total is likely to remain above 30 billion board feet per year. Millions of poles and posts are extracted annually from our forests, besides, and millions of cubic feet of fuel wood and miscellaneous products. If we reduce the volume of all uses to a cubic foot basis the total annual consumption is 12.2 billion cubic feet. Fires, insects, and diseases consume another 1.2 billion cubic feet. This makes the total drain 13.7 billion cubic feet. The annual growth is estimated at 13.4 billion cubic feet or slightly under the drain.*

In the West the relation between growth and drain is not yet as favorable as it is for the country as a whole because we still have a large acreage of old growth on which the accretion is generally balanced by natural losses and because we have not been logging on a large scale as long as the East. With the rapid increase of better cutting practices and more intensive protection measures our Western growth and drain ratio should, within a short generation, be in balance.

Recreation

Not only is the forest important for its material products; it is still our favored recreational retreat and hunting ground. The water user depends on forested mountains for much of his water. The naturalist finds the forest an ideal spot for a wide range of studies and observations—of birds, animals, insects, plants. Each year more of the public and private forest area is taken out of industrial

*These data are from the U. S. Forest Service *Miscellaneous Publication No. 688* and are for the entire nation. It is necessary to consider the United States as a whole even when we think in terms of Western forests alone, because much of our Western lumber is shipped to the great Eastern markets.

An old "cat" skids logs from the stump to the landing. Immature trees and trees of low immediate value have been left. They will serve as seed trees and some will develop into merchantable trees for a future cut. (U. S. Forest Service).

timber production by reservations for recreation areas, landing fields, parks, and highways. Summer homes in second growth areas are multiplying rapidly. The demand for public parks in old growth areas is of long standing and not yet satisfied. Such reservations are desirable and inevitable as people gain more leisure and as roads and automobiles improve. Their impact on the available productive land may become serious, but their influence on more intensive forestry is beneficial.

It is natural that there should be such widespread concern over what is happening to our forests. Fires, insects, disease, and logging are the chief agents affecting the commercial forest.

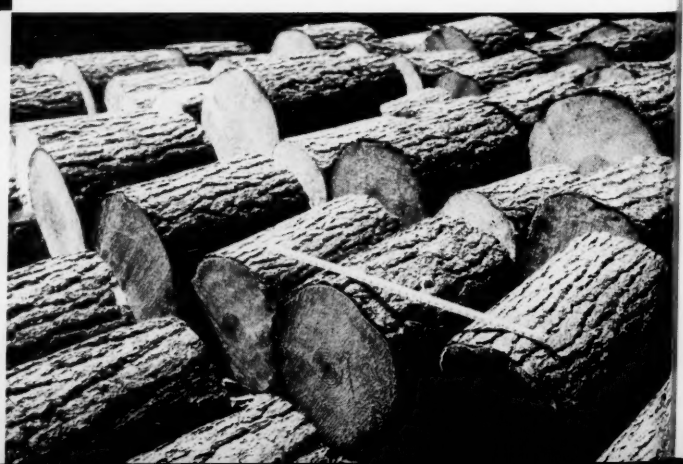
Forest destroyers: Fire

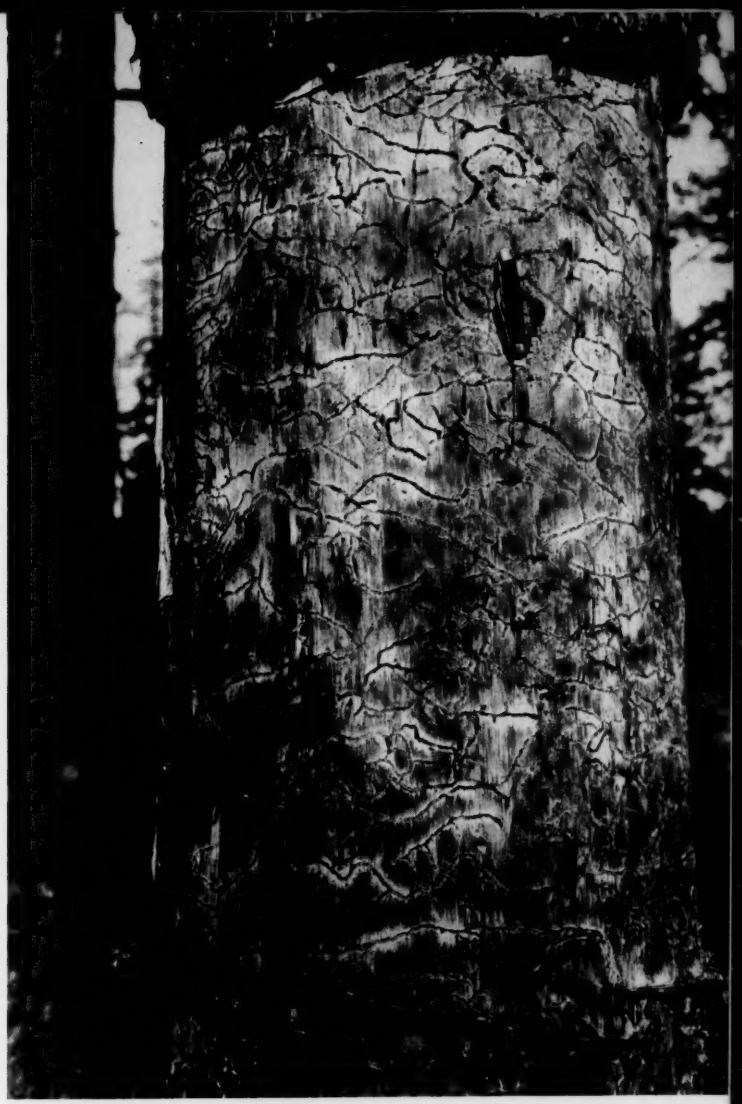
In the early days of the West fires were permitted to spread uncontrolled. Fires covering 50,000 acres were common. In 1910, fires burned more than 3,000,000 acres in the Northern Rockies alone. About 40 years ago Western private owners began forming protection organizations to prevent and combat fires. They were instrumental in the passage of the Clarke-McNary Act under which the Federal government assumes part of the cost of protection. They had a hand also in strengthening the protection activities of the state forestry departments. At the same time, private operators improved their own protection facilities; some now exceed the state law requirements by a wide margin.

We are fast approaching the time when the Western states will have forest fire fighting stations at frequently spaced intervals throughout the forest regions. The states are responsible for protecting the forest lands outside the national forests and parks; they are doing an excellent job and constantly improving upon it. It costs money to protect forests. For example, the California State Division of Forestry spends $8,000,000 a year on fire protection, including forest, grass, and brush areas. Each state fire station is equipped

↑ To get lumber, trees must be felled – even this operation has been largely mechanized. Here an electric chain saw, taking power from a generator on the tractor, is used to fell a mature ponderosa pine. A cat will skid the logs to the landing to be loaded onto trucks and hauled to the mill. At the pine mill, lower picture, logs cut from virgin forests are being dumped into the millpond near stacks of rough green lumber drying in the air.

→ This is second growth ponderosa pine cut into bolts for box veneer. (U. S. Forest Service photographs)





Insects kill six times as much timber as fire destroys in the pine forests of California. This old ponderosa pine was killed by the mountain pine beetle whose irregular galleries girdled the tree. (U. S. Bureau of Entomology and Plant Quarantine)

with fire trucks, special pumpers, bulldozers, hand tools, and radio. Crews of men, like the firemen in a city, are in constant attendance during the fire season.

Despite the vast improvements that have been made in fire prevention, prompt detection, and quick suppression, we still have fires. As late as 1933 the Tillamook fire in northwestern Oregon killed 12 billion feet of excellent old growth timber. In 1936 large fires burned in many parts of the West, and again in 1945. These were "fire years"—years of a dangerous combination of protracted periods of low relative humidity, high temperatures, and high winds. Whereas lumbering was once the principal cause of forest fires, it is now far down the list. Worst offenders today are smokers, campers, and debris burners.

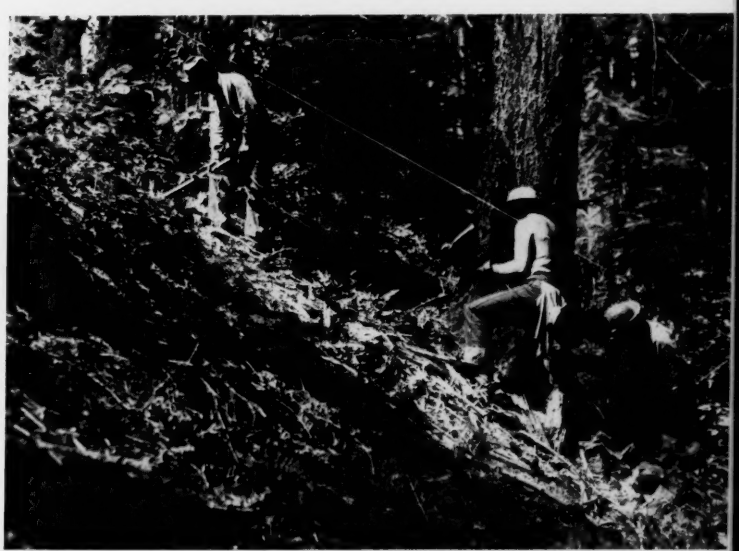
Insects

Insects have always been in the forest, killing trees here and there, but at times they reach epidemic proportions and destroy millions of feet of prime timber in one locality. In the pine region of California, for example, they are estimated by the U.S. Bureau of Entomology and Plant Quarantine to have killed 10 billion board feet of pine in 15 years. Insects kill six times more pine timber in California than fire. In the Central Rockies they have killed four billion feet of old growth timber and threaten the remainder. Private owners have given active attention to the control of insects. They were the first to adopt a system of cutting, devised by Federal entomologists, whereby the most susceptible trees are cut first. The lumberman thus beats the insects to the trees and saves those trees that are not highly susceptible.*

Disease

White pine blister rust is the West's chief forest tree-killing disease. It attacks only the five-needle pines, among which are the valuable Idaho white pine, the sugar pine, and several high altitude

A crew cuts out Ribes plants in a national forest to control blister rust. (U. S. Forest Service)



*In 1947 Congress belatedly passed a coöperative insect control law along the lines of the Clarke-McNary coöperative fire protection law of 1924. But only in 1949 was an appropriation made. If it works out as well as the fire law, our insect losses can be cut drastically.

Old ponderosa pine in northern Arizona. (Pen drawing by Don Greame Kelley)

species mostly in our national parks. Fortunately the disease is of the dual-host type, the alternate host being any species of the genus *Ribes*—currants and gooseberries. It is not native to Western forests, having come originally from Europe. In the West it was reported first in British Columbia in 1910; moving steadily south, it has now reached Amador County, California. Control of this disease calls for eradication of the less valuable *Ribes*. Each summer hundreds of men are employed to remove this host from localities where timber values are high.*

Logging

Logging is the forest operation that generally gets most attention from the public. Its often casual character has been so widely publicized by foresters and particularly by the U.S. Forest Service that it has come to be looked upon as an undesirable operation *per se*, with lumbermen being called wilful destroyers. Indeed, logging was for some generations without plan for future crops of timber, owing to the belief that our vast supplies of timber are inexhaustible; that logging cannot be made continuous on the same land; and because of a widespread feeling in some regions that the land should be cleared and converted to agricultural uses.

Lumbermen no longer believe that our forests are endless; the more progressive of them are now so thoroughly converted to the crop idea that they are managing their lands on a continuing basis, as farmers do. The land-clearing concept still holds to some extent, however, and paradoxically there is a conflict among different public bureaus and among different sectors of the public as to the proper land use. One bureau or group interested only in forestry believes cutover lands should be kept in forest; others believe the land, after logging, should be burned and seeded to grass for livestock ranges. The conflict exists within and between such agencies as the U.S. Department of Agriculture and state agricultural departments, extending even to agricultural colleges. Trespass by stockmen on adjoining cutover lands has been common. Slowly the differences are being resolved. They are being resolved because of the growing realization that supplies of timber are basically as important, in peace or war, as future supplies of meat, wool, and hides.

In European nations such as Germany, Poland, France, Switzerland, Austria, Finland, and the Scandinavian countries, lumbering is looked upon as a necessary harvest operation, much as the people love their forests. In these countries forests are grown to be cut down and converted into lumber, wood pulp, and chemicals. They "destroyed" their original forests centuries ago, and have been

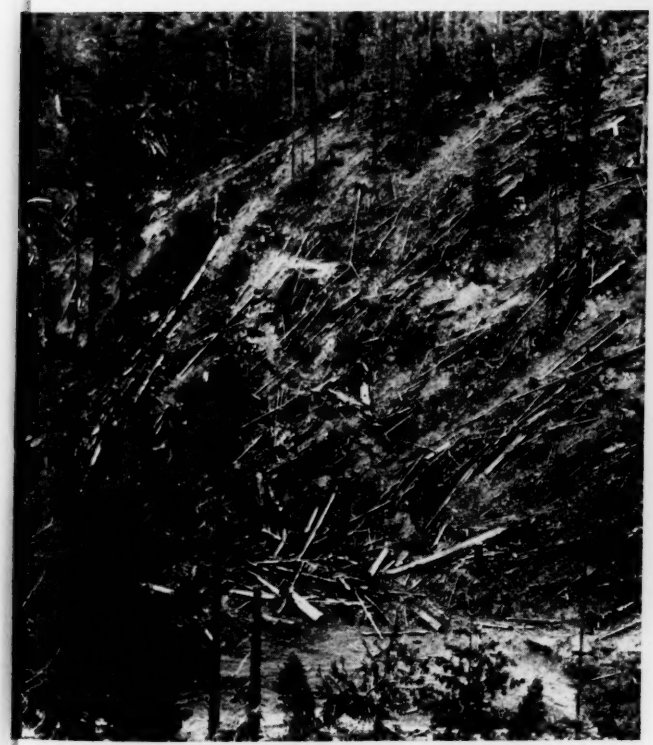
*This work started soon after World War I on an experimental basis. In 1940 the Lea Act stepped up control measures on a coöperative basis among the states, private owners, and Federal bureaus.

growing new ones for several hundred years. In America, on the other hand, we have been taught lately to look upon logging as anti-social. Nevertheless, after 300 years of nationwide cutting, we still have great areas of original old growth, most of it, by far, in the Western states. And we have some of the finest second growth in the world despite our mishandling.

Forests cannot be grown to merchantability in one year as farm crops can. Even pulpwood takes about 20 years, while sawlogs may need 50 to more than 100 years of growing, depending upon the species and locality. These long "rotations" have had a profound influence, delaying better forest practices (as our tax systems have also, when they have militated against holding the cutover land and the young growing stock).

Planned lumbering pays

But all that is undergoing a most remarkable, and accelerating, change. Forestry is "coming into its own." Each year sees more timberland owners discarding casualism for planning that involves changed methods of cutting, more intensive protection, and the assurance of prompt natural reforestation for future crops. Some are recapturing cutover lands they once abandoned. Self interest may be said to be an important incentive. Business men prefer continuity for their operations whether it means lumbering, manufacturing, or large-scale farming. As the country fills up they know they cannot exhaust resources in one place and move to another area. Also, the states are appreciating the importance of stability and of creating favorable business climates. It is, in short, beginning to pay to cut old growth more wisely, to hold cutover lands for future crops, and to set up forest production departments. This has profound implications for our entire national economy. Not only are we assured of basic raw wood for lumber, pulp, and chemicals, but the communities depen-



Some destructive logging is still being practiced, as this recent photo shows, to the concern of progressive lumbermen who know this sort of thing gives the whole industry a bad name. In the pine forest here only a few immature trees escaped. (U. S. Forest Service)

This is selective cutting in a redwood forest. Tractors took the logs out. The redwood forest is of a mixed-age type; when the mature trees are removed, the remainder, left standing, grow more rapidly, at the same time shedding seed to reforest the gaps. Four to thirty trees are left per acre, depending upon the composition of the stand. (Emanuel Fritz)

dent on forest industries become stabilized, the tax base is not depleted, payrolls continue, recreation facilities are promoted, wildlife continues, and the influence of the forest on erosion control, watershed protection, water supplies, and esthetics is not impaired. Specifically, what are the principal activities of private timberland owners directed toward making forests continuous?

Keeping forests green

In 1941 several private owners in the state of Washington, deeply concerned that the success of their forestry operations was jeopardized by the carelessness of the forest-using public, decided to undertake a publicity program designed to make their own employees and the local public more fire-conscious and cognizant of the benefits to their own welfare of a stable lumber industry. Their slogan was "Keep Washington Green." The program worked so well that the idea has spread across the nation—we now have similar movements in other states, thus: "Keep Oregon Green," "Keep California Green and Golden," and "Keep Minnesota Green."

Tree Farm program

Also in 1941, a similar program to encourage forestry was undertaken, which now uses the slogan 'Trees for America" with the substitution of the state's name for "America" to localize the effort. Concurrently, the organized nationwide forestry operations were "glamorized" under the name "Tree Farms." These programs, like the "Keep Green" program, started in the Northwest and have spread over the country. As we enter 1951, the Tree Farm program embraces nearly 22,000,000 acres of private forest land. This program directs attention to the management of forests on a continuing basis. It has captured the public's imagination and, with it, its coöperation and support. Generally—this is significant—these several programs are sponsored solely by private industry through regional trade associations. In some instances the states sponsor and promote them.

The Tree Farm program works in this way: The associations receive applications from owners for tree farm certification and, after proof of quali-

The Douglas fir forest in Washington state is characteristically even-aged and is cut clean in blocks. Intervening strips and blocks are left standing to furnish seed for natural reforestation. This method is not desirable in mixed-age forests, such as pine and redwood in California. (Courtesy West Coast Lumbermen's Association)

Until two years ago this little engine hauled redwood logs over a redwood trestle in Mendocino County. Trucks now do its job. (Redwood Empire Association)

fication, issue certificates and the right to post the tree farms with appropriate signs. Thereafter annual inspections are made. If the basic principles of tree farming are violated the certificate and right of posting are revoked. A tree farm is described as an area of privately owned forest land devoted primarily to the continuous growth of merchantable forest products under good forest practices. No lower or upper limit of area is specified. Tree farms already certified in 27 states vary in size from 20 acres to over 500,000 acres.

To qualify as tree farmers the owners must agree to: (1) maintain the specified area of land for growing forest crops; (2) protect it from fire, insects, disease, and excessive grazing; (3) harvest timber in a manner that will assure future crops; (4) furnish information when requested concerning their tree farms.

The tourist or recreation-seeker may not be aware of tree farm activities as he travels the main roads. The more accessible areas have been largely cut over years ago and the traveler still has the old unsightly areas in his line of vision. But wherever a tree farm sign is placed he can rest assured that the young growth already started is being protected against fire. Should he go to the active operations he will find seed trees left standing—anywhere from four to more than 20

per acre—or there might be blocks of uncut timber adjoining clear-cut areas. On some old large areas of clear cutting there is planting. In the Pacific Northwest the lumber industry keeps a coöperative nursery producing about 10,000,000 young trees a year. Once an area has been cut and seed trees left or planting accomplished, there is little the owner can do but protect the area—and wait. Planting is not necessary where seed trees are left.

Young white fir in Arizona. (Pen drawing by Don Greame Kelley)

Logging esthetics

Logging is, unfortunately, an unsightly operation, no matter who does it or how intensive the forestry practices. Felled trees inevitably create slash. Sometimes this slash must be disposed of by burning, at other times it may and should be left. But what is unsightly about a properly cutover area is temporary. Once the forest cover has been restored, the area again looks pleasing to the eye. There is not yet a sufficient demand for pulpwood to take care of all the chunks, broken or defective logs, and limbs that clutter up a logged area. But fortunately the demand steadily increases.

In all the Western forest regions there are large areas of cutover lands that were logged too clean in the past and are now devoid of seed trees and often covered with valueless brush. Here and there, where conditions permit, such lands will be replanted. On others, reforestation must wait until experimental proof of methods has been obtained. In all cases of brush covered cutovers, second growth, and old growth, fires must be kept out. Wild fires and forestry are incompatible. To permit the new tree farms to increase productiveness and contribute their share to the economy, the owners must hope that their own fire protection efforts will be supplemented by greater care on the part of the public that may be using their forests for recreation and travel.

The future?

Western private forestry is young—but vigorous; and it is in the hands of enthusiastic and competent young foresters. These technicians have the support of their employers and the coöperation of state forestry officials. Left to continue the work already so well started, they will play an important part in assuring the West against a shortage of timber, against permanent unsightliness of logged-off lands, against the loss of recreation grounds and good scenery, and against the economic losses attendant upon the old cut-out-and-get-out policy. Western forestry deserves the commendation and support of the public and its elected officials. In a few more decades, if the present rate of progress continues, we should be able to describe it as a great achievement of American industry. END

REVIEWS

FISHES OF THE WESTERN NORTH ATLANTIC. Part One. Lancelets, Cyclostomes, Sharks. Lancelets (pp. 1-28, figs. 1-3) by Henry B. Bigelow & Isabel Pérez Farfante; Cyclostomes and Sharks (pp. 29-546, figs. 4-106) by Henry B. Bigelow & William C. Schroeder. Editor-in-Chief, John Tee-Van. Memoirs of the Sears Foundation for Marine Research, No. 1, New Haven. 1948. xvii + 576 pp., 2 maps, 106 figs. $10.00.

At the time Dr. Barton Evermann, former director of the California Academy of Sciences, collaborated with Dr. David Starr Jordan to complete the four volume *Fishes of North and Middle America* (1896-1900), scientists agreed that most of the facts about North American fishes had been recorded. Printed for the first time was a thoroughly scientific treatise which contained the last word in ichthyological knowledge. There was one serious objection, however, in that the publication was so scientific that its usefulness was limited to those with sufficient technical training. The writer still remembers vividly the difficulties he encountered as a beginning ichthyology student in attempting to decipher the correct meanings from the text and keys in these volumes. In the 50 years following the publication of Jordan and Evermann a vast amount of new information has accumulated so that this monograph has lost much of its original usefulness. Hence there has been a critical need for a new compendium of such a nature that it could be used by both the layman and the scientist. The *Fishes of the Western North Atlantic* is designed to meet that need in the geographical area which it covers. This first volume which was several years in preparation is an exceptionally thorough and well-illustrated work.

It sets a very high precedent, and those who are to write the other sections for subsequent volumes will find it difficult to meet these standards. Most valuable is the extensive annotated reference section for each species. In some cases these references cover several pages. This allows the reader to search quickly through the entire literature concerning any given species and to select such original references as may be of especial interest. The simplified keys are easy to use and, with the aid of the many drawings for each species, one should be able to identify a lancelet or shark without difficulty. The arrangement of the text allows ready accessibility to any desired information. The material is grouped under such headings as: Study Material, Distinctive Characters, Description, Color, Size, Developmental Stages, Remarks, Habits, Relationship to Temperature, Breeding Habits, Food, Relation to Man, Range, Occurrence in the Eastern Atlantic, Occurrence in the Western Atlantic, Seasonal Migrations, Wintering Grounds, Numerical Abundance, and Synonyms.

Some of our Pacific Coast sharks are closely related or identical to those of the Atlantic American coasts. Consequently a book such as this first volume of the *Fishes of the Western North Atlantic* might also prove to be very useful in our own region. A recent example of such usefulness may be of interest. At the 1950 Shark Derby held at Coyote Point near San Mateo in the southern part of San Francisco Bay there were only five dogfish sharks in a total catch of 996 sharks. This was very strange for previous records had shown that the dogfish formed about 25 per cent of the normal shark population in the bay. Unfortunately we have little knowledge of the fluctuations in abundance of this species on the Pacific Coast. A quick check in Bigelow and Schroeder, however, revealed that the same species of dogfish in the Atlantic makes widespread migrations as well as short movements from locality to locality. It thus seems reasonable to assume that this migratory tendency probably accounts for the absence of dogfish at the recent Shark Derby.

The Academy has pioneered in the publication of basic monographs on animal and plant life in the western Americas. One need only mention Arnold's *Paleontology and Stratigraphy of the Marine Pliocene and Pleistocene of San Pedro* (1903), Gilbert and Starks' *The Fishes of Panama Bay* (1904), and Van Denburgh's *The Reptiles of Western North America* (1922) to bring to mind others of this type. Although Pacific Coast ichthyology has lagged, it will not be many years before the knowledge of this region has advanced to the point where the definitive work on the fishes may be written. After such material has been painstakingly prepared, with the *Fishes of the Western North Atlantic* as a standard of excellence, it is hoped that the Academy, in a similar manner to the Sears Foundation, may be instrumental in bringing such basic information to the public.

EARL S. HERALD

Steinhart Aquarium
California Academy of Sciences
San Francisco

LIFELONG BOYHOOD: *Recollections of a Naturalist Afield.* By Loye Miller. University of California Press, Berkeley and Los Angeles. 1950. ix + 226 pp., illustrated. $2.75.

It is observable that naturalists appear to enjoy life more than most people—an intentionally two-ply remark. Through the enjoyment of living things Loye Miller, emeritus professor of zoölogy at U.C.L.A., has enjoyed living, to an enviable degree. Only a happy man could have written such fresh, such sparkling chapters as those in his *Lifelong Boyhood,* from "Early Days" to "Cruising Down the Latitudes" on a long-deferred sabbatical. Only a scientist with a large, good-humored view of all life could have penned so engag-

ingly the "Selected Writings" of the latter third of his too-short book. The biographical part is racy, anecdotal; the scientific papers (some "adapted" for this book) are such that, were there more like them, more laymen would avidly read more scientific papers–for pure pleasure as well as for instruction. The "Biography of Nip and Tuck," for instance, could hold its own with the best short stories; and one reader, at least, plans to try henceforth a more instinctual approach to his 5-year-old son.

In "The Territorial Instinct" you will see what fun you can have with two owls–if you are expert at bird calls and go around "making like" an owl in the dawning. Returning to the biographical part, a dull title, "The Cape Region of Baja California," covers as salty a yarn about a gang of ebullient young collectors on a field trip as you'll ever read. The leader, Billy Price, was a member of the C.A.S., "and we were nominally a party from the Academia de Ciéncias, which gave us much prestige" with the Mexicans–but you can infer Loye's fiddle and bottle of witch hazel gave them even more.

One thing many will get from this book, though it is nowhere explicit (Dr. Miller plainly believes you should live in the present), is the sharp sense of something drifting away: whatever it is comes to mind when old-timers say "those were the days," and when a few of their sons–reading ". . . we moved to the almost virgin country of Riverside, California, when I was two and a half years old . . . the wild country was at our very door"–look wryly out the car window, miles from town, at beer cans and billboards. But at 70 that philosopher-teacher, Dr. Miller, would roundly scold any student of his who yiped for a past he was born too late for. The crowds are here, to stay and to increase. No use crying over their multiplying machines and wilderness-gulping suburbs. Better to be grateful, with Loye Miller, that life has brought "new flowers, new trees, new scenes, new appreciations, new friends, both human and otherwise, new understandings of old friends" and that "new questions have been answered; old questions newly and more clearly answered; old answers newly interpreted. New concepts have been exchanged for the old, new horizons revealed beyond the old." And the naturalist has an ace-in-the-hole; besides the human, he has in nature "a sort of reserve fund of friendships . . . should he lose patience with the general run of folks." D.G.K.

Index to Volume III

ERRATA

January-February 1950 — Page 14, col. 2: FOR *perigrinus* READ *peregrinus.*

July-August 1950 — Page 4: FOR at least READ at last. Page 5: FOR in the last READ in the least.

WHAT THE VIEWERS SAY ABOUT "SCIENCE IN ACTION"

"I find it difficult to express what an exciting experience it was for us when we chanced upon your TV program. It was reassuring confirmation that science can be made adventurous. Last week's program on bats, and this week's program even more, produced in me the desire to participate, to know more, to familiarize myself with many of these things in nature of which I have heretofore only been vaguely aware."

". . . Excellent. It is educational as well as entertaining and I feel certain that programs such as yours will make television one of the major educational mediums of the future. Most children find studying a drudgery, but just try to keep them away from a television program!

"As an instructor in general science and biology, I would unhesitatingly recommend such a television showing, not only for the 'general public,' but for daytime schoolroom observation, as instructional visual aid."

". . . Does much to raise the quality of television programs, particularly in providing attractive educational features for young people."

"I am convinced that television must earn its way into the hearts and homes of America with an appeal of merit through its benefit to education and knowledge, as well as with entertainment. Such programs as are offered by the California Academy of Sciences justify that injunction, and will help much to overcome the distaste of poor material, feeble entertainment, and the inane, inept . . . commercials. Good luck!"

"May I as a teacher in the San Francisco school system and as a parent thank you for this fine public service? I feel that your discussion of scientific matter was done educationally, entertainingly; its content is well organized and with such variety that it even held the attention of my very active nine-year-old son. I congratulate you and your organization for presenting a program which renews my faith in television."

"My father bought a new television set last week. I invited my schoolmate who lives in the next block to see your program. We liked it very much because it is not the ordinary kind where you learn not a thing. We have science in school and the things you have on your program help us with our school work. We are getting tired of so many screaming murders and mystery stories which we hear on the radio. Every child likes Nature and Science really, if it is only made interesting. The only suggestion we can give is that you make your program longer so that there is more of it."

"It is seldom that one sees such a fine program. . . The Academy of Sciences and the American Trust Company are to be complimented. . ."

"San Francisco's most important television experiment . . . has a strong appeal now. It is new. It is novel. It is the best thing of its kind I have seen. But it can be better, much better. . ."—DWIGHT NEWTON, *San Francisco Examiner.*

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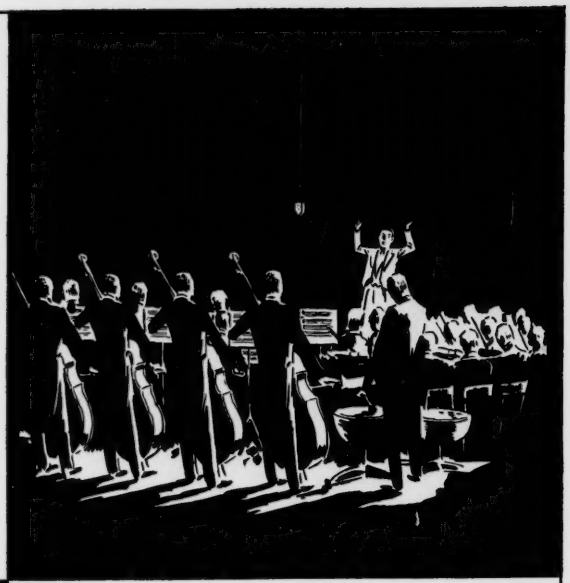

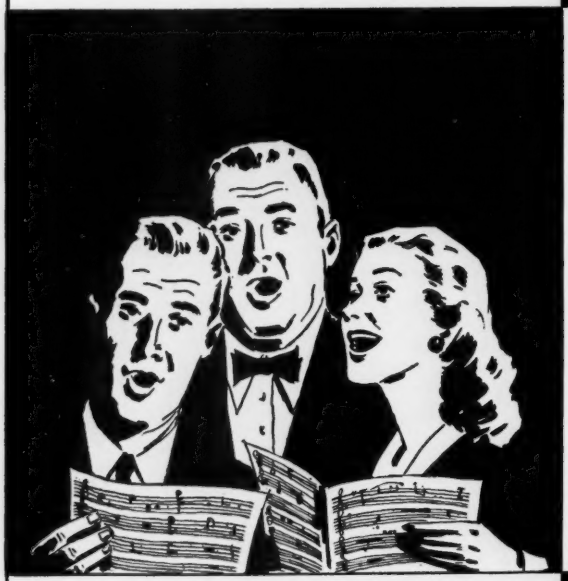

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